SCIENTIFIC AMERICAN

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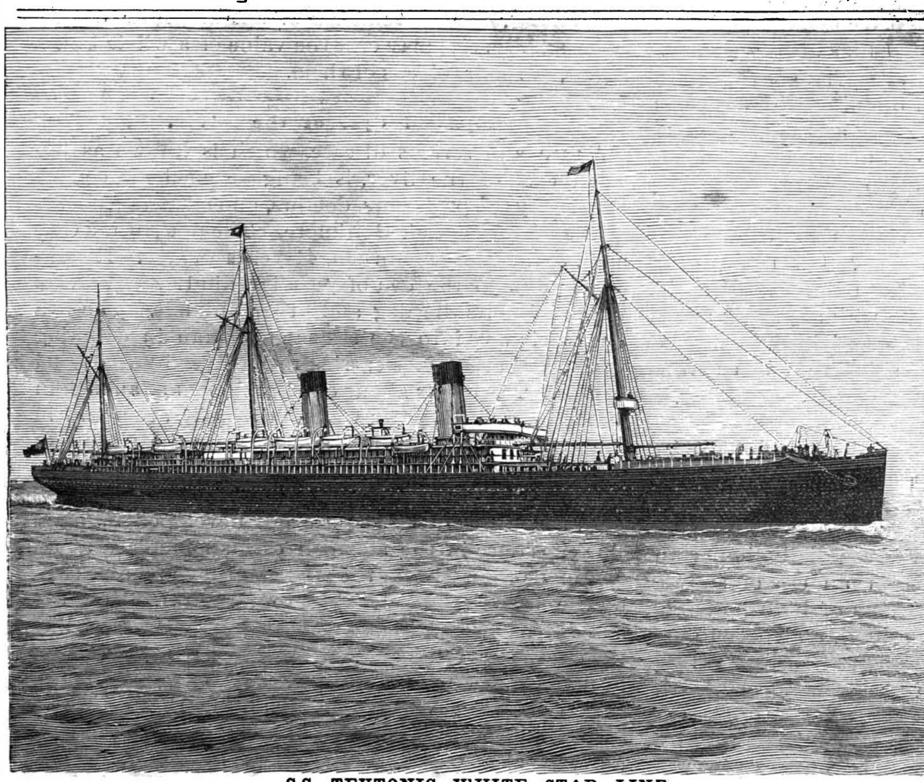

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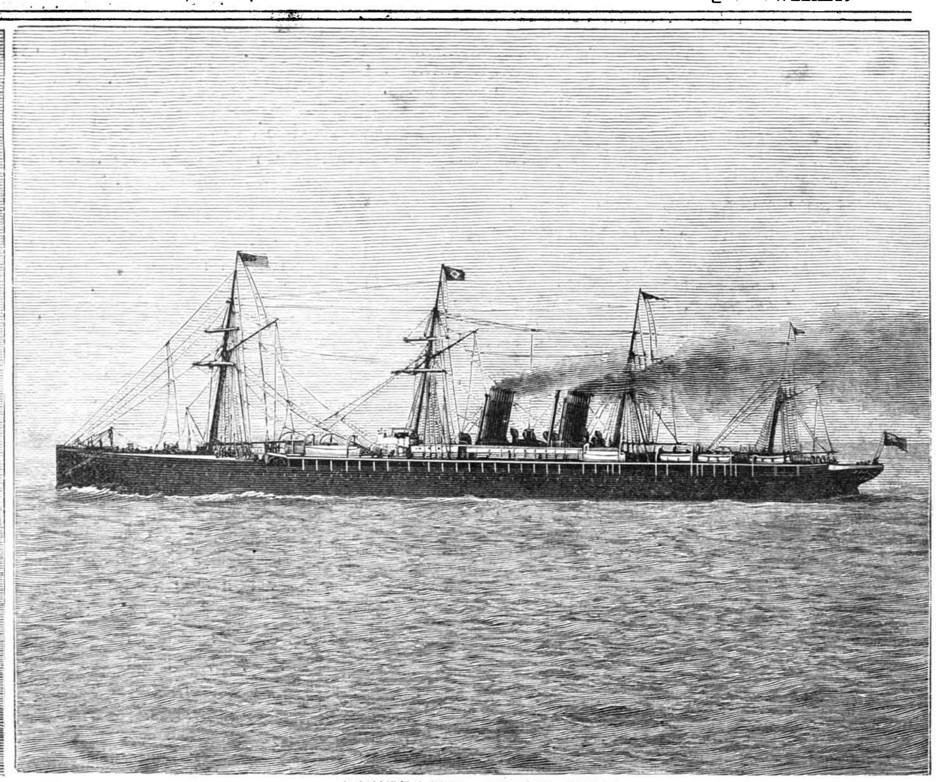

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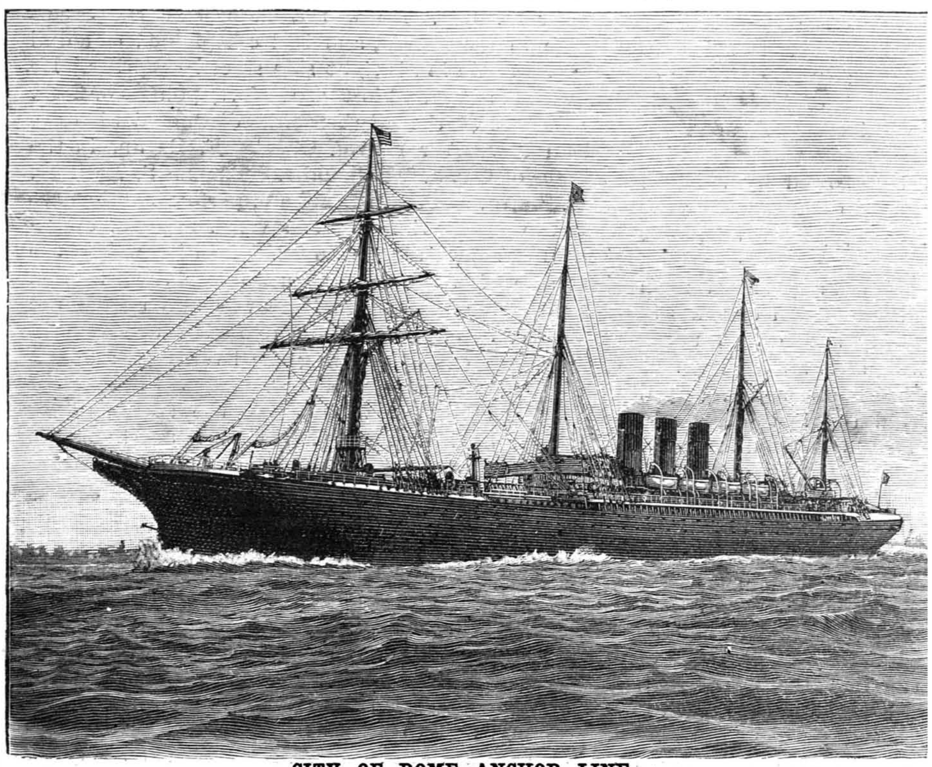

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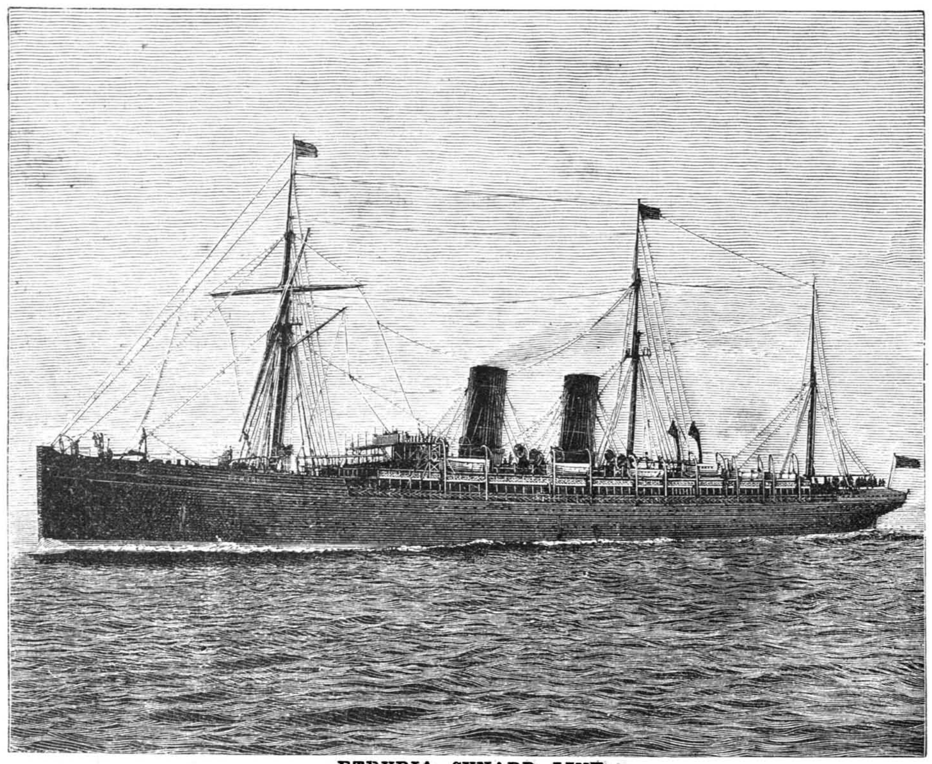

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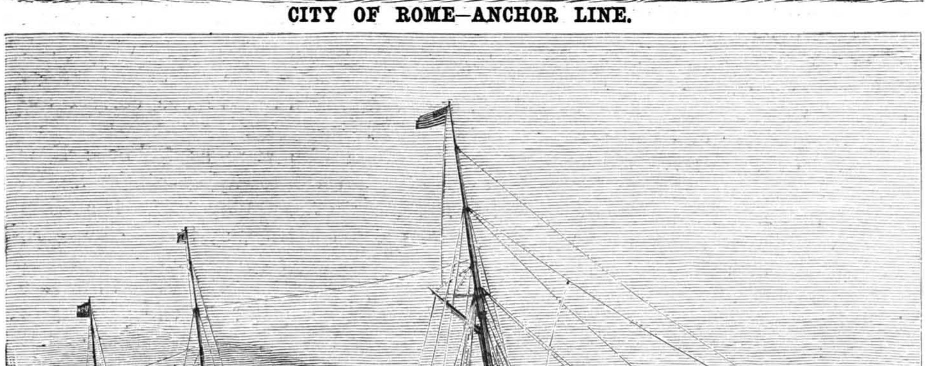

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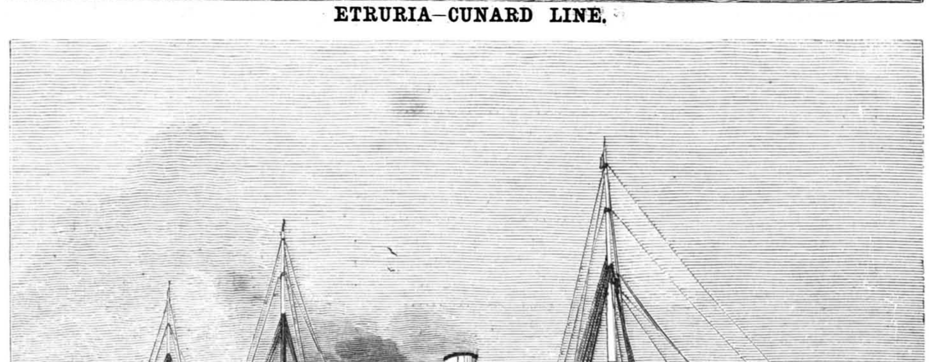

AUGUSTA VICTORIA—HAMBURG-AMERICAN LINE.

PASSENGER SHIPS OF THE TRANSATLANTIC SERVICE.—[See page 389.]

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Contents.

(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT
No. 729.

For the Week Ending December 21, 1889.

Price 10 cents. For sale by all newsdealers.

NAVAL NOTES.

We give in another column an account of the new British steel cruiser Blake, lately launched, expected to be the largest, fastest, and strongest boat of her class, 9,000 tons displacement, 375 feet length, 65 feet beam, 25 feet 9 inches draught, armored turtle-backed deck, 20,000 horse power 22 knots speed, or over 25 miles per hour. She is to be armed with handy rapid-firing guns that can penetrate 12 or 15 inches of armor plate. Some heavier and some lighter guns will be added. Our new dandy ship the Chicago, and her three companions, which lately sailed from Boston for Lisbon and the Mediterranean, are pygmies not only in dimensions but in speed and armament, as compared with the Blake. The Chicago is of 4,500 tons displacement, 15 knots speed or less. It seems impossible for Congress to wake up to the necessity of building ships that combine the elements of superior speed and power. Of all our new ships so far built or authorized, not one of them can compete in these all-important respects with the late examples of European vessels. What is the good of building a lot of inferior ships that can be both whipped and outsailed by others? Let us have fast ships that cannot be beaten. Let us have strong ships that can stand up and do battle with anything afloat. If we cannot have these qualities conjoined, let us have them in separate vessels. Of ships that can neither fight nor run we have already too many.

HIGH TENSION CURRENTS IN CROWDED CENTERS.

The recent fires in Boston and Lynn, both traced more or less directly to electric light currents, raise a question which has grown more vital with time and the multiplying of wires, and is especially important now that we have entered upon an era of subway construction. It is: Are currents of high potential, whether above or below the ground, a menace to property? We learned long since by practical experience that aerial mains were not to be trusted, because the falling or drooping of even a telegraph wire upon them will effect that cross-circuiting which has proved so disastrous; charge, may be, an innocent gas pipe with a 2,000 volt current, and, perhaps, make a water pipe carry fire as well as water. As to the buried wires, we have, it seems, still less to hope for. Mr. Edison, in a recent interview, says of them: "The placing of electric wires in subways, instead of lessening the dangers to life and property, will increase them. They are likely to be grounded through undiscoverable breaks in insulation. This is followed by making, perhaps, a lamp post dangerous to life, charging the iron frame of a store awning, a gas pipe or a telephone wire."

Thus, it would appear, there is not as yet any known mode of safely distributing high-tension currents in populous centers. Such evidently is the view taken by the authorities of Lynn, who, after an inquiry into the causes leading to the recent disastrous fire, prayed the Common Council to forbid the introduction of electric light wires into the streets and buildings of that city's business center.

It has been said by an expert electrician that, though there is no agent more prolific of danger than electricity when unscientifically or carelessly handled, there is no other element or force that is more capable of self-control or that can be rendered less harmful. But it is this very fact that a single defective wire or the act of a stupid or careless person may imperil life or fire buildings that makes the introduction of high tension currents into crowded centers of doubtful expediency. In Boston, so we read, an arc light wire fell upon a burglar alarm wire and a wire belonging to an electric time distributing wire; these two carrying their borrowed intensity into their respective buildings, there to fire the woodwork along their path.

Curiously enough, it was in Boston where steps were first taken looking to official superintendence of electric wiring, the Board of Underwriters refusing risks upon buildings having electric light service, unless the wiring was done by men whom they had examined for efficiency and licensed. The light companies concurring in this, "the insurance companies of their own accord made a reduction in insurance rates on all buildings and manufacturing establishments where electricity was used as the only illuminant; a reduction of 10 per cent. on incandescent and 5 per cent. on arc light plants." [Extract from a paper read before the National Electric Lighting Association, March 2, 1889.]

Later on it was found that the class of wire first approved, and known as "underwriters'" wire, because of such approval, was not a sufficient safeguard against fire, and the Boston Fire Underwriters' Union agreed upon another type and further restriction, as will be seen in the following order, which we take from the proceedings of the same meeting of the National Electric Light Association:

BOSTON, February 1.

TO ELECTRIC LIGHT AND WIRING COMPANIES:

"It has been decided by the Boston Fire Underwriters' Union that, on and after March 1, 1889, they will not approve underwriters' wire for electric light wiring in any manner inside of buildings. Moisture-proof and water-proof wire must be used. All loops or drops, from poles or other outside structures, to and into buildings, must also be of a heavy moisture-proof insulation. It must first be submitted to the inspector for his approval. This rule applies to all new work, also to any change made in old work." . . .

It would thus seem that the Boston underwriters used due diligence, adopted every known precaution, and though, no doubt, preventing many possible calamities, they are yet unable to avert such disasters as the late one. Wherever a high tension service parallels or crosses an exposed low tension service, there is danger of fire. A burglar alarm wire, though protecting against housebreakers, may introduce an incendiary; the convenience of telephone or district messenger service may cost the value of a whole building or, perhaps, blocks of them.

Hydatid Cyst of the Liver.

A rare and serious disease, which is known as hydatid cyst of the liver, is being watched with great interest by the professors, doctors, and medical students at the City Hospital, Baltimore. The patient is a German, John F. Bersenbruch, 44 years of age. His disease is due to the ova of peculiar kind of tapeworm which inhabits the dog and other animals. The ova find their way into the stomach of man in drinking water, and are thence carried to the liver by the blood vessels. The egg is about one hundredth of an inch in diameter, and the parts which develop it are found in the water, on the ground, and stick to the surface of vegetables, and thus it is possible in eating vegetables uncooked to take the ova into the body. The animals from these ova, however, are not developed in man. The eggs once in the stomach of man increase at an enormous rate. From the stomach they are absorbed by the blood vessels leading to the liver. Here the ova form cysts or little bags around themselves, like the caterpillar in its cocoon. When this cyst is taken into the stomach of the dog, it develops into the full grown hydatid, which is one-quarter of an inch in length, with a head one-sixtieth of an inch, and having numerous little hooks and suckers.

Bersenbruch was admitted to the City Hospital on October 25, 1889. He was a laborer at the Jesuit College in Woodstock, and had complained of a dull but severe pain in his right side since last spring. He had wasted away and lost nearly forty pounds of flesh. The doctors at the City Hospital diagnosed his case, and on November 1 Prof. Charles F. Bevan, in the presence of Drs. J. W. Chambers, Thomas S. Latimer, W. F. Smith, and John Branham, performed what has up to the present time proved a very successful operation. Prof. Bevan made an incision in the wall of the right side of the abdomen, just below the ribs, and about a gallon and a half of pus was taken from the man's liver. The method of removing the hydatid cysts is by means of draining the liver, which operation is of modern surgical art. The pain of the patient before the operation was intense, the tumor in his right side having extended his liver nearly fifteen inches. The great pain seemed to leave him after the operation, and he now appears to be recovering.

A Negro Mathematician.

Sam Summers, the negro prodigy, was in town recently, and, as usual, entertained a large crowd, who were testing him with all kinds of mathematical problems. Summers is a negro 34 years old, without the slightest education. He cannot read or write, and does not know one figure from another. He is a common farm hand, and to look at him and watch his actions he seems to be about half-witted, but his quick and invariably correct answer to any example in arithmetic, no matter how difficult, is simply wonderful. With the hundreds of tests that he has submitted to, not a single time has he failed to give the correct answer in every instance.

Some examples given him were as follows: How much gold can be bought for $792 in greenbacks if gold is worth $1.65? Multiply 597,312 by 13⅝. If a grain of wheat produces seven grains, and these be sown the second year, each yielding the same increase, how many bushels will be produced at this rate in twelve years if 1,000 grains make a pint? If the velocity of sound is 1,142 feet per second, the pulsation of the heart seventy per minute, after seeing a flash of lightning there are twenty pulsations counted before you hear it thunder, what distance is the cloud from the earth, and what is the time after seeing the flash of lightning until you hear the thunder? A commission merchant received seventy bags of wheat, each containing three bushels, three pecks, and three quarts. How many bushels did he receive? And so on.

With Robinson's, Ray's, and other higher arithmetics before them, those who have tested him as yet have been unable to find any example that with a few moments' thought on his part he is not able to correctly answer.—*Louisville Commercial.*

AT Aspinwall on the Atlantic side of the Isthmus of Panama the rise of the tide is only 1½ feet, but at Panama on the Pacific side there is at times a difference of 21 feet between high and low water.

[FROM THE N. Y. SUN.]

Edward N. Dickerson.

Edward Nicoll Dickerson, LL.D., a very eminent member of the bar of New York, died December 12 at his house in Far Rockaway, L. I., at the age of 65. He had been ill of a complicated disorder since April last. He was the second son of the Hon. Philemon Dickerson, who was formerly United States District Judge for the district of New Jersey, and he was a nephew of the Hon. Mahlon Dickerson, Secretary of the Navy in President Jackson's administration. Young Dickerson graduated at Princeton College, and three years afterward he was admitted to the bar at Paterson, in his native State. For some time he served as clerk of his father's court, but he resigned that office and soon entered upon a prosperous career as a lawyer. Gifted with many natural and acquired qualifications for it, and with indomitable industry, he became a distinguished patent lawyer. Among his earliest clients was the late Samuel Colt, inventor of the repeating firearm known as the revolver. Mr. Dickerson's first laurels were won by his successful establishment of Colt's patent, and in that litigation he displayed an extraordinary adaptability to the practice of the patent law. Being both theoretically and practically a mechanical engineer, and possessing great personal strength and activity, he ran for a time as engineer, or driver, the first locomotive engine that was put in operation between Paterson and New York. This gave him a propensity to study the subject of steam in all its applications; and while in after years some of his theories encountered opposition, there has probably been no man in America in his time who was a more accomplished steam engineer. He knew the whole history of steam, from the Marquis of Worcester's "Century of Invention" down to James Watt; and from Watt down to George Stephenson. At a later period he turned his attention to marine steam engines, and if the United States navy had not been under a management opposed to his ideas, a great advance would have been made in the use of steam as a motive power on the water.

In 1852 Mr. Dickerson removed to New York, and immediately entered on a lucrative practice here as a patent lawyer. It was while he still resided and practiced in Paterson, however, that he conducted Colt's litigation to a successful issue. Colt's revolver had been used by our troopers in the Mexican war with great effect, and infringements of his patent soon followed. The Massachusetts Arms Company, manufacturers in Springfield, Mass., was the concern which undertook with the most energy to break down Colt's patent. The suit brought by Colt against this company was an action at law, and was tried in Boston before the late Judge Levi Woodbury and a jury, in June, 1851. The usual specifications of prior invention were made by the defendants, and the defense of non-infringement was also set up. But the great struggle was over the novelty of Colt's invention. Mr. George Ticknor Curtis was then practicing in Boston, and he was retained two days before the trial to aid Mr. Dickerson as senior counsel for the plaintiff. The defense was conducted by the late Hon. Rufus Choate and by the Hon. Reuben A. Chapman, of Springfield, who afterward became Chief Justice of Massachusetts. Colt was lavish in the use of money, and in the preparation of the case Mr. Dickerson was supplied liberally with the means necessary to trace every alleged priority of invention that had been specified in the defense, before the trial came on, as the law required, in whatever part of the country the alleged prior invention was located. So thoroughly had Mr. Dickerson done his work that, as each of the supposed priorities was brought forward in the evidence and explained to the jury, Mr. Dickerson was ready to demolish it by rebutting evidence, and his senior associate, when he came to sum up the whole case, had a comparatively easy task. Mr. Curtis has often said, however, that he became at different times during the protracted trial a good deal anxious because of the apparent resemblance between Colt's repeating chamber and some of the supposed prior inventions. But in every instance, so thorough had been Mr. Dickerson's preparation, that each of the alleged priorities was exploded, and the plaintiff obtained a triumphant verdict.

An amusing instance that occurred during the trial illustrates the wisdom of the law which requires a defendant to give notice of the time, place, and person having a prior knowledge of the thing patented. A cylinder having, like Colt's, different chambers for different charges, and revolving in apparently the same manner, was put in evidence by the defense. It looked old and rusty, and it was located at a town in the interior of New York, and a deposition was read of the man in whose possession it was said to have been found. After this proof had been made, an expert witness was put on the stand, who testified very confidently that this old fossil was the same thing as Colt's revolver. When Mr. Dickerson came to cross-examine the expert, he rose and handed up to the witness a letter which proved to have been written by the expert himself to the man whose deposition had been read, telling him how to prepare this old cylinder to be produced in court. This, of course, broke down the defense in that part of it, and so it was all through the trial. The very eminent counsel for the defense could have known nothing of this fraud until it was made plain to them before their eyes, and their clients had only trusted too implicitly to a dishonest expert, who was employed to prepare the defense.

Mr. Dickerson's reputation soon led to his employment in many important cases after he removed to this city. He became, along with the late James T. Brady, counsel for Charles Goodyear's patent for vulcanized India rubber. Goodyear, one of the most remarkable inventors of this country, had succeeded, through great difficulties and often through extreme poverty, in accomplishing the invention which has bestowed so much benefit on the practical arts. His chief opponent was Horace H. Day, a man of singular energy, and an untiring antagonist. The validity of Goodyear's patent was brought to judicial determination in the Circuit Court of the United States for the district of New Jersey, in the equity suit of Goodyear *vs.* Day, before Mr. Justice Grier. At that time Goodyear, who was always a careless and embarrassed man, had parted with a large part of his interest in the invention. Mr. Augustus H. Dorr, a lawyer who had advanced money to Mr. Goodyear when he was prosecuting his researches, had become interested in the patent, and an attorney named Judkins, who was also interested, had the management of the interest of all the several owners. Mr. James T. Brady and Mr. Dickerson were selected as the counsel for the Goodyear interest, and by them the case was prepared, for hearing. As the time for the hearing approached, it was learned that the principal advocate for the defendant was to be Mr. Choate. The plaintiffs therefore retained Mr. Webster, who was at that time Secretary of State in President Fillmore's administration (1852). Mr. Webster came to Trenton a short time before the hearing, to be instructed in the case. Mr. George Ticknor Curtis, in his life of Webster, relates the following anecdote, the person to whom he refers, but whose name he does not give, being Mr. Dorr:

"Without expecting to be taken literally, Mr. Dickerson asked Mr. —— to make his suggestions to Mr. Webster. Thereupon Mr. —— repaired to Mr. Webster's room, and spent the greater part of the evening in explaining his views of the case. On the following morning, Mr. Webster met his associate in the breakfast room and said to him, 'My young friend, did you send Mr. —— to me last evening?' 'Yes, sir; to be honest about it I did, but I did not believe he would go.' 'Well,' replied Mr. Webster, with a smile, 'you appear to think that I am the residuary legatee of every man's nonsense.'"

Another anecdote may be given which Mr. Curtis has not mentioned. Among the numerous counsel assembled at Trenton for the Goodyear patent was Mr. Staples, an elderly patent lawyer of this city. He expected to take some part in the argument, but none had been assigned to him. Embarrassed by the situation, Brady and Dickerson asked Mr. Webster's advice as to what they should say to Mr. Staples. "You, Mr. Brady," said Mr. Webster, "must open the case, and, as to Brother Staples, ask him to see me." Mr. Staples called upon Mr. Webster, who said: "Brother Staples, I am not very well, and, moreover, I may be called back to Washington before the case is closed. I wish you would watch it, and be prepared to make the closing argument in the event of my having to go away." Mr. Staples was quite satisfied with this arrangement, but Mr. Webster did not go away; on the contrary, he made a most magnificent argument, which carried the case for the Goodyear patent.

It was, however, a difficult task for Mr. Brady and Mr. Dickerson to instruct Mr. Webster in the details of the case and get him interested. He came to Trenton on the eve of the assembling of a Whig national convention to nominate a candidate for the presidency, and his attention was absorbed in politics. But he had a marvelous faculty for appropriating and turning to account the labors of other men, and after many consultations, preparation of briefs, etc., by his associates, he was wrought up to the needful warmth, and made the argument, which Mr. Choate afterward said exhibited "perfect mastery of the cause in its legal and scientific principles and in all its facts." Webster was then 69. He died in the following autumn, October 24, 1852. When he entered the court room on the first day of the hearing in Goodyear's case, Judge Grier, with whom Dickerson was a great favorite from his boyhood, called the latter up to the bench and said to him in a whisper: "Ned, what have you brought that great elephant here for? Do you expect that he will trample us all down?" Dickerson replied with a smile: "I think, judge, you can hold your own."

It would be tedious to refer to even a part of the great patent litigations in which Mr. Dickerson has been concerned in the past thirty years. He became the most eminent patent lawyer in the United States, and his professional emoluments from this branch of business were very large. His last and most prominent success was in establishing the Bell telephone patent in the Supreme Court of the United States, in association with Mr. Storrow, of Boston. No advocate of our time has been listened to with more attention and respect in the highest national tribunal. Mr. Dickerson was of commanding stature, full frame, and very expressive countenance. His eloquence was of the kind peculiarly effective in a class of cases which often affords materials for touching descriptions of the trials and struggles of inventors. But he never lost sight of the scientific and legal principles of his cause. Thoroughly master of both, he combined what was affecting in the personal history of an inventor with the most profound discussion of the science and the law on which his client's rights depended.

Mr. Dickerson's accomplishments were not confined to the practice of his profession. He ranged over the whole field of science, and one of his favorite pursuits was astronomy. His house in Thirty-fourth Street, built by himself, is surmounted by an observatory, in which he erected, at great expense, some of the best instruments that could be procured. There he used to spend many hours in studying the skies. He was a warm friend of the late Prof. Henry, and his eulogy on that eminent scientist, pronounced at Princeton College, was a very noble tribute to a great man. Among his other recreations, Mr. Dickerson kept and sailed a fine yacht, but he did not take part in any of the races. His beautiful marine villa at Far Rockaway, and his house in town, were abodes in which hospitality, with all the appliances of wealth, was adorned by the genial spirit of a man who loved his friends and was ever studious of their comfort and enjoyment. A very wide circle will mourn for his death.

In politics, like his father and uncle, he was a Democrat of the Jackson school of Democracy, and this means that he was a Union man in all his feelings and political principles. During the civil war he was one of the class designated as "war Democrats," and along with Mr. James T. Brady and Mr. John Van Buren he advocated the second election of Lincoln, although he personally admired the Democratic candidate, Gen. McClellan. He was often consulted by President Lincoln, whom he had known as a lawyer in Illinois. In the last presidential election, Mr. Dickerson's manly letter, in which he declined to support the Democratic candidate because of the free trade tendency of the Democratic party under the lead of Mr. Cleveland, was another instance of his political courage in the assertion of his convictions. His inherited opinions on the subject of protection to our home manufactures against foreign competition had been confirmed by a wide knowledge and observation of the entire field of American industry.

Mr. Dickerson left a widow and an only son, who is one of the most prominent among the younger generation of patent lawyers, and who inherits much of his father's ability. Mr. Dickerson's only daughter died some years ago. It is understood that he leaves a large fortune, the result of his professional earnings and successful investments. Upon whatever he touched, he impressed himself as a man of great force of intellect and character, extensive knowledge, varied and versatile abilities, and untiring energy. The qualities of his mind, however, were not judicial. By nature and training a great advocate, he rarely saw more than one side of a subject, but that side he espoused with consummate skill. This is the proper function of an advocate, and it is that in which a lawyer is most useful to the tribunal before which he appears, as well as most useful to his client. Whatever might have been Mr. Dickerson's success as a judge, if he had been placed on the bench at an early age, his career as an advocate has been an eminently useful one. To his professional opponents he was always courteous, although he could, when occasion seemed to invite causes for it, mingle denunciation and sarcasm with reasoning. But it is not known that he ever made an enemy of a professional opponent, while he had hosts of friends, and when the contests of the forum were over, those with whom there had been sharp interchanges while the battle went on were often seen as guests at his table or on his yachting excursions, where all the antagonism was forgotten.

GEORGE TICKNOR CURTIS.

Our Want Column.

Our old advertisers and readers are familiar with the Business and Personal column of this paper, as a medium for the exchange of "wants." In the present issue there are several demands for competent men who can present suitable letters of reference to take charge of departments in large factories. There is always a demand for competent superintendents and first class workmen, and it is the desire of the publishers to make the column a general medium by means of which the employer and the employed can come into relationship. They also desire to make it a bulletin for the buying and selling of patents, and for effecting leases, territorial sales, the procuring of reliable traveling agents, and for arranging contracts with manufacturers for the production of patented articles under royalty. The circulation of this paper is so much larger than that of any other scientific or mechanical publication, that the advantages offered by the use of this column to manufacturers, operatives, and inventors are unrivaled.

AMIOT'S STAIR CLIMBER.

The apparatus represented in the accompanying engraving is designed to save a person the fatigue of walking up a flight of stairs. Its inventor's idea has not been to replace the ordinary elevators, of which the applications are numerous, but to provide a device for use in private houses or other buildings where the use of an elevator would be limited. In principle, this new mode of ascension is based upon the adaptation to existing stairways of a movable platform, capable of carrying a person from one landing to another. The arrangements vary according to circumstances; but the installation includes the following essential parts:

1. A guide, which generally consists of two flat iron bars supported here and there by small columns and placed at a distance of a couple of inches from the banister.

2. A carrier, consisting of a vertical part, which moves upon the flat bars that serve as rails, and of a horizontal platform, upon which a person stands.

3. A motor, which may be an electric, hydraulic, or any other sort of one. This actuates the carriage through the intermedium of a chain or cable; but the arrangement of the transmission may vary according to circumstances. For example, the motor may exert a direct traction or else actuate a transmitting shaft, from which each apparatus individually takes the necessary power in the desired direction.

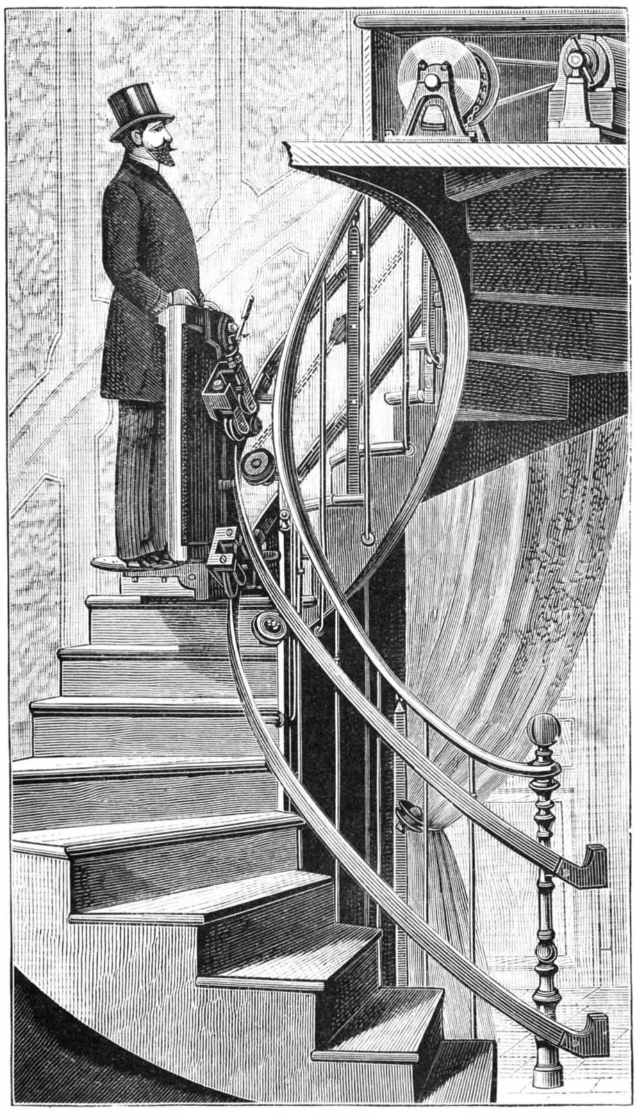
At Paris, where water under pressure is to be had everywhere, and where, before long, electricity will be at the disposal of the public, each special case will determine the selection of the most advantageous motor. The same is the case in other large cities. For country seats and isolated dwellings, when the installation is worth the trouble, a reservoir of water might be established at a certain height for supplying the motor. There is no impossibility in the application anywhere. The only question is that of expense. The apparatus of the different stories are independent and operate isolatedly, so that one can ascend while another is descending. We figure the apparatus as it was exhibited in operation to the public at the exposition, where it was one of the novelties shown. The motor employed was an ordinary Miot dynamo, which, through the intermedium of an endless screw, actuated a shaft that carried a drum around which the traction chain wound.

The ascent and descent and the stoppage of the motor are effected at will by the simple maneuver, in one direction or the other, of a small commutator lever connected with the machine by a flexible conductor, and which permits of reversing the current in the armature. As the inductors are supplied by a special derivation always of the same direction, the motor is made to rotate at will in one direction or the other for ascending or descending.

At the exposition, the current was led by two aerial wires, which connected Mr. Amiot's installation with the pavilion of the engines which actuated the rolling bridge. Mr. Amiot used electricity because the putting up of two wires was simpler than the laying of the piping necessary for a hydraulic motor.

In most installations, however, water under pressure would be employed as a motive power. With the relatively low pressure of the public conduits, a special arrangement would permit of supplying, at a high pressure, very small motors concealed in a box placed on each landing.

This stair climber can carry but one passenger at a time; but, as there is an apparatus operating isolatedly for each story, visitors may ascend successively from story to story, or one visitor can descend while another is ascending.—*La Nature.*



AMIOT'S STAIR CLIMBER.

The Coming Mechanic.

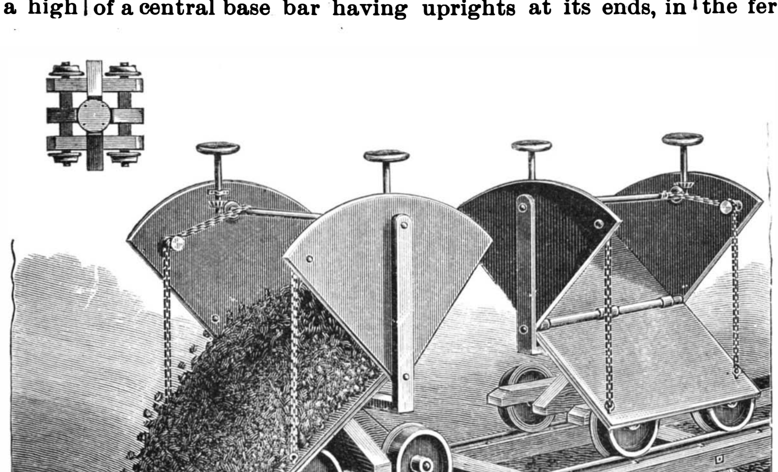
The coming mechanic, says an exchange, bred in training schools, will be a very different man from the mechanic of the present. Even the young mechanic who is now learning in the shop will, in some very important respects, be at a disadvantage when he comes into contact and competition with the young mechanic who is now in the school.

The shop graduate may be "practical," and the school graduate will be equally "practical," with the added advantage of wide theoretical knowledge. The shop graduate may be able to do all the work planned or designed for him, and the school graduate will be able, not only to do the work, but also to do the planning and the designing. In every way the school graduate will have all the good points of the shop graduate, with added good points due to wider information, while he will lack most of the bad points of the shop graduate.

All this means that the coming mechanic is to be a very different person from the present and the past mechanic. There will be a great change for the better wrought by the modern training school. The boy in the shop may be set to turn a wheel. He simply sees it in position, and he does what he is told to do, without asking or knowing the reason why it is done. The boy in the training school goes through the same practice under full instructions concerning the nature of the material, the proper cutting speed, and everything else connected with the job. The shop boy finishes, and is simply tired muscularly or nervously. The school boy finishes, and feels himself master of that particular job. Can any mechanic fail to appreciate the wide difference between two mechanics trained in ways so different?

AN IMPROVED DUMPING CAR.

A dumping car so constructed that the contents of the car may be readily discharged is illustrated herewith, and has been patented by Messrs. Gustav Bogusch, of Vallecillo, Mexico, and August Zincke, of Llano, Texas, administrator of Robert J. Bogusch, deceased. The car body is preferably of wrought metal and the truck frame of wood, the car body consisting of a central base bar having uprights at its ends, in which are mounted the ends of a rod extending lengthwise over the bar, and having doors hinged thereto to form the V-shaped sides and bottom of the car, the ends being made of sector-shaped plates fastened to the uprights. When closed the doors abut against the inclined edges of the end plates, and may be held closed by a hook arm pivoted to a bracket on the upper edge of the doors and engaging a rod having its ends secured in the end plates, or by other suitable means. The car body is pivoted on the truck, a plan view of which is shown in the small figure, so that the body may be turned to discharge the load in any direction, the top of the bolt extending downward through the truck being formed with a circular plate resting on the cross beams of the truck, the bolt being held in place by a washer and pin bearing against the under side of the bottom beam. The doors may be raised and lowered by hand, or by a hoisting mechanism of chains connected at one end to lugs on the doors, passing over pulleys at the top of the end plates, and about a drum on a shaft having its bearings in the end plates, the shaft being operated through a bevel gear by a hand wheel on a vertical shaft. This improvement may also be applied to long cars, the car frame being extended lengthwise and a number of compartments mounted on a series of trucks similar to the single truck shown.



BOGUSCH'S DUMPING CAR.

For further particulars with reference to this invention, address Mr. George G. Fish, No. 45 Van Buren Street, Brooklyn, N. Y.

Ricin—a Poison contained in Castor Oil Seeds.

The poisonous principle present in castor oil seeds has been variously represented as an alkaloid, a glucoside, and an organic acid. But as the result of an exhaustive chemical and pharmacological investigation, recorded in a lengthy treatise (*Arbeit. d. pharmakol. Inst. Dorpat*, part iii., p. 59), Herr Stillmark has come to the conclusion that it is an albumenoid body, identical with the "β-phytalbumose" separated from the dried juice of *Carica Papaya* by Sidney Martin, and belonging to the class of unformed ferments.

This substance, which has been named "ricin," may be prepared by exhausting well pressed peeled ricinus seeds, reduced to powder, with a 10 per cent solution of sodium chloride, saturating the clear percolate at the ordinary temperature with magnesium sulphate and sodium sulphate and keeping it in a cool place, when, besides large crystals of the two sulphates, a white precipitate easily separable from these is formed. This is placed in a dialyzer, with frequent changes of water, for six days, after which the residue is removed and dried over sulphuric acid and can then be reduced to a snow white powder, which still contains 10 to 20 per cent of sulphate. This substance is a most powerful poison, exercising a remarkable power of coagulation, so that the blood coming into contact with a minute quantity that has been absorbed is coagulated, blocks the lumina of the intestinal capillaries, and causes thrombosis and echymosis. Even when introduced subcutaneously, the principal action of the poison appears to occur in the intestinal canal, and not at the place of injection.

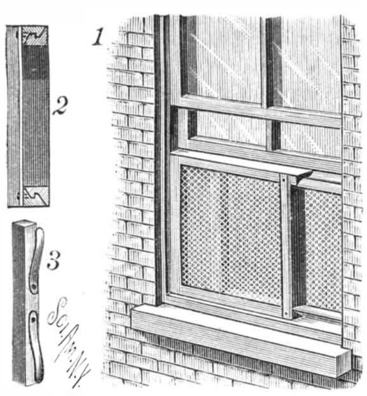
The lethal dose for a man weighing sixty kilogrammes is estimated as 0·18 gramme, and it is stated that this quantity is contained in the press cake from 3 grammes of peeled seeds. In view of this fact that the residue from the pressing of castor oil contains such large quantities of a tasteless poison exceeding arsenic in toxic power, and at present not to be detected in the body by any known method, Herr Stillmark raises the question whether it should not be made compulsory upon manufacturers to burn the cake or render it harmless by a process of boiling that would destroy the ferment. Experiments were also made upon the seeds of nine other species of ricinus, as well as those of *Croton Tiglium* and *Jatropha Curcas*, and in each case a poisonous albumenoid substance was separated, similar to if not identical with ricin, and belonging to the class of ferments. It is pointed out by the author that the coagulating power of ricin explains the external application in some countries of crushed ricinus seeds as a hæmostatic.

The Yorktown.

In recent speed trials at Newport, the United States cruiser Yorktown was given four trials, with four runs over the measured mile for each trial. The first trial was to find the lowest speed at which she could run, and the mean of the four was 4·4 knots per hour, with 109·98 horse power. The second trial was to run the vessel at a speed of 10 knots per hour as nearly as possible. The mean speed was 10·6 knots and the horse power 728·61. The third trial was at full speed, with natural draught, resulting in 14·8 knots per hour and 2318·98 horse power. Under forced draught at full speed in the last trial the speed was 16·6 knots per hour and the horse power 3578·68. The horse power given is for the main engines, air circulating, and feed pumps alone. To get the total indicated horse power, 82·25, made by the blower and other auxiliaries, must be added, giving 3661·03, or 270 more than was made on the contractor's official trial. The speed was also just half a knot faster.

AN IMPROVED WINDOW SCREEN.

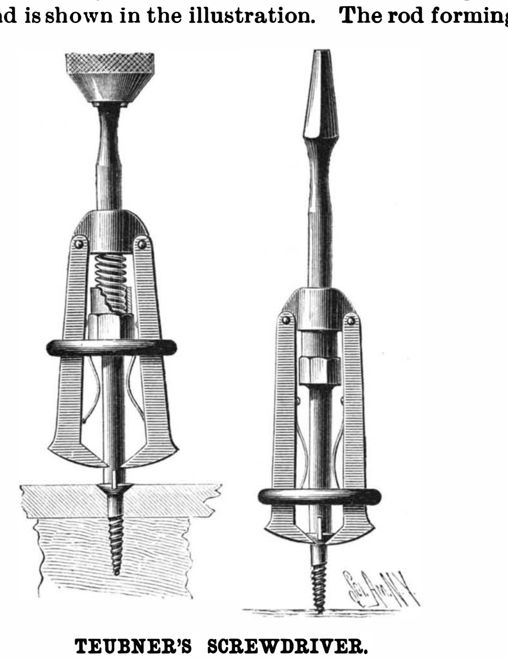
One of the principal troubles with adjustable window screens heretofore has been that they must be removed in order to lower the sash, but such objection will not hold against the screen herewith illustrated, which is designed to be fixed in position entirely outside the sash, where it may be allowed to remain throughout the season. It is a patented invention of Mr. William D. Graves, Jr., of Presque Isle, Me. The wood frame of the screen is made in two sections, the top and bottom rails of which are intended to slide upon each other when the entire frame is to be varied in width. These top and bottom rails have diagonal meeting faces made with a longitudinal groove and corresponding rib, to form a locking connection, as shown in Fig. 2, Fig. 1 being a view in perspective of such a screen applied to a window. A filling strip at the inner end of one section covers the space by which the wire cloth of the two sections is held apart, and to the outer end stiles are attached strips adapted to project the inner face of the screen toward the lower sash, outside of which the screen frame is located, in the sashways or grooves provided for the vertical travel of the upper sash. Elliptical plate springs are secured upon the outer edges of the end stiles, as shown in Fig. 3, to hold the screen in place as desired. It is reported that there has been a large sale of these screens during the past season.



GRAVES' WINDOW SCREEN.

AN IMPROVED SCREWDRIVER.

A screwdriver which will clamp the head of a screw and hold it in fixed position while it is being driven has been patented by Mr. Charles G. Teubner, of Lexington, Mo., and is shown in the illustration. The rod forming


TEUBNER'S SCREWDRIVER.

the body of the device is adapted to fit a brace or be received in a screwdriver handle. It has a screw-threaded portion on which screws a hub having an upwardly extending portion serving as a housing for a spring, and between the hub and the handle end of the rod is a sliding sleeve, having ears, to which are pivoted tapering jaws, these jaws having concaved and chisel-shaped edges for engaging the beveled head of the screw. To the inner surfaces of the jaws are attached curved springs, which bear against the central rod and tend to force the jaws outward. The spiral spring between the hub and sliding sleeve tends to press the latter toward the handle end, and thus carry the jaws away from the point, while an oblong ring surrounds the jaws and serves to draw them together when the ring is pushed downward. The lower end of the central rod is squared, and has a central slot in which is a rib adapted to fit into the nick of a screw, the rib being secured by a pin or screw, so that it can be readily replaced when broken or worn out. When the rib is in engagement with the nick of the screw, the sleeve is pushed down to bring the jaws into engagement with the head, and the ring is slipped down to clamp the jaws in position, as shown in one of the views; when the screw has been driven in until the jaws approach the surface, the ring is moved up, releasing the jaws, as shown in the other view, and the screw is turned until its head is flush with the surface of the material.

PIGSKIN is now extensively used for gloves and children's shoes.

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MUNN & Co., 361 Broadway, New York.

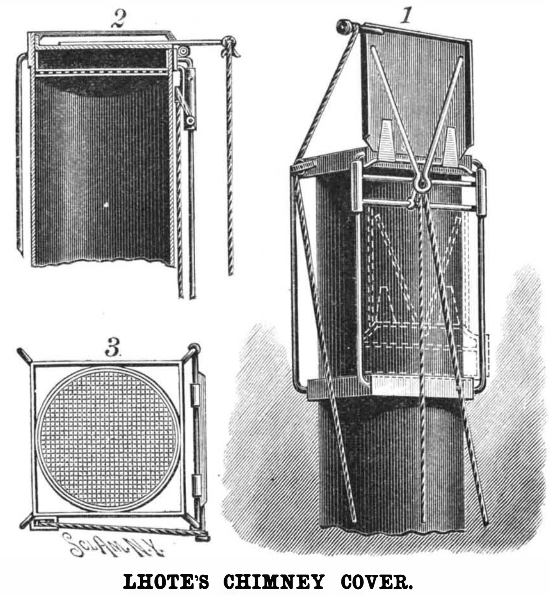
Failure of the Hot Water Company.

The Boston Steam Heating Company, organized a few years ago to furnish steam for heating and power to the citizens of Boston by means of highly heated water, has been forced to suspend operations, owing to the rusting away of its pipes, which are laid under the principal streets of that city. Over four miles of mains were put down, at a cost of over $2,000,000. It was recently found that the return pipe through which the water is conducted back to the station has rusted away, although it has been in the ground less than two years.

AN IMPROVED CHIMNEY COVER.

A cover for chimneys, to extinguish fires arising in the chimneys from burning light fuel, etc., is shown in the accompanying illustration, and has been patented by Mr. George Lhote, of New Orleans, La. (P. O. box 722). The cover is hinged on a frame adapted to slide on the upper end of the chimney, and downwardly extending cables or ropes afford means for opening and closing the cover, Fig. 1 showing it open and Fig. 2 closed, while Fig. 3 is a plan view showing also the wire screen fixed in the chimney near its top. Two rectangular supporting frames are secured on the upper end of the chimney, and connected together by stays, on which slide sleeves carrying another frame, and a rod on which is hinged a cover, preferably of sheet metal. On the outward end of the cover is a sidewise extending rod to which is fastened a rope passing over a pulley and down to the ground, whereby the cover may be swung downward, when it is in the position shown in Fig. 1. On the top of the cover, and forming a loop projecting over its rear end, is secured a V-shaped rod, a rope from this loop, seen to the right in Fig. 2, extending down to the ground and being used to raise the cover and pull it back to the position shown in dotted lines in Fig. 1. A third rope has one end fastened to a bar of the sliding frame, the rope passing thence over a pulley on the top supporting frame and down to the ground. On pulling the latter rope the cover is raised from its normal position, shown in dotted lines in Fig. 1, to the position shown in full lines, when the cover may be swung downward over the chimney top by means of the rope attached to the outer end of the cover.

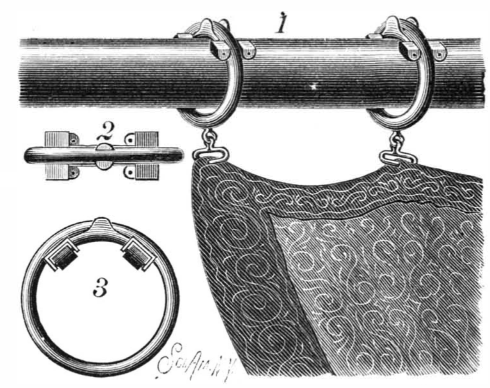
This device is principally intended for use in saw mills, sash factories, and other wood-working factories in which the waste wood and shavings are employed for fuel in furnaces or ovens.



LHOTE'S CHIMNEY COVER.

AN IMPROVED CURTAIN RING ATTACHMENT.

An attachment to facilitate the movement of a curtain ring along its cylindrical rod or pole support is illustrated herewith, and has been patented by Mr. Napoleon B. Allen, Fig. 3 being a side view of the device applied to a curtain ring, and Fig. 2 a plan view, while



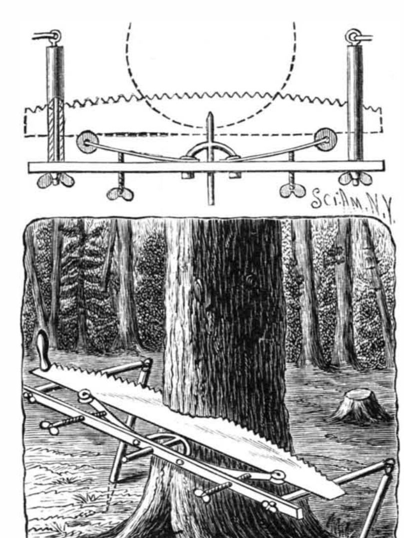
ALLEN'S CURTAIN RING ATTACHMENT.

Fig. 1 shows rings in use fitted with the attachment. The body of the device is made of thin sheet metal, shaped to fit the inner surface of the ring, on which it can be readily slipped by slightly springing the metal of the two small central flaps or ears which extend slightly above the ring. At each end of the body there are formed right-angled extensions, with dependent lips or ears, apertured to receive the pintles of small anti-friction rollers, the bearing faces of which rest flat upon the peripheral face of the rod or pole in connection with which the attachment is used. The sheet metal body of the device is preferably formed from a blank.

For further information relative to this invention address Mrs. Lois O. Jones, No. 16 Court Street, Brooklyn, N. Y.

AN IMPROVED DEVICE FOR FELLING TREES.

The accompanying illustration represents in plan view and perspective a portable device with which it


BROWN'S DEVICE FOR FELLING TREES.

is designed that an ordinary cross-cut saw may be operated by one man to saw off trees near the surface of the ground. The invention has been patented by Mr. Percy Hull Brown, of Vesuvius Bay, Salt Springs Islands, B. C., Canada. A bracket bar of wood has spaced holes near each end, which receive the ends of bolts passing through long axially-bored rollers, over which the saw may be reciprocated, the outer ends of the bolts carrying the rollers being supported by rods, constituting legs, while the bracket bar is centrally supported against the tree by a spike bar. Oppositely on the spike bar, on the inner side of the bracket bar, are curved arms having collars to bear against the ends of spring carrier plates held against the inner face of the bracket bar. The carrier plates are made of spring steel, and their outer ends are pressed toward the saw by bolts, each adjusted by a set screw, the outer ends of the plates being bifurcated to form ears in which are pivoted grooved pulleys adapted to loosely fit the rear edge of a saw blade, and hold it up to its work as the saw is reciprocated on the rollers. The carrier plates are given sufficient set or bend by the set screws to cause a proper tensional action, and thus feed the saw forward as it is reciprocated, the set-screw bolts being further turned to keep the saw up to its work as the sawing proceeds.

ONE of the latest applications of electricity is the making of a floor mat that throws out heat—an electric heater, in fact, in the form of a mat. An excellent device for warming the toes.

Florentine Pietra Dura or Mosaic Work.

Her Majesty's Consul-General at Florence says that the proper technical term for the so-called Florentine mosaic work is *commesso*. They are composed of delicate slices of stones, carefully cut into shape, arranged and joined together (*commessi*) with a fine cement, and then fitted into a thin slab of marble. The pictures are produced by the natural tints of the stones, the selection of which requires great taste and skill. Works in *commesso* are executed in the following manner:

After the design has been prepared, the thin slices of stone selected for the various parts are distributed among a certain number of workmen, each of whom completes the portion of the design intrusted to him, the whole subject being subsequently united. The stones, after being cut into the required shapes, are carefully set together with a cement made of wax and mastic (*pece greca*), heat being used to bind them together. Slate is employed to support the work during its progress, and to line it when complete. At each stage the first lining affixed to the separate parts is ground down and a fresh one affixed, so that an even surface may always be secured. When the complete design is fitted into the marble slab prepared for its reception, the whole of the base is again ground down to a perfect plane, and is lined with a fresh backing of slate. The fitting is performed with the greatest care, the edges of the several parts being filed until the exact dimensions have been attained. The whole surface is afterward polished, so that the lines of juncture are rendered almost invisible. To bind on the lining heat is used, as also for uniting the small pieces. The operation is very carefully performed, so that no more cement than is absolutely required should remain between the parts that have been joined together.

The first operation of sawing the stones into thin slices, from 2½ to 3 millimeters in thickness, is performed by means of thin blades of iron or copper, emery powder giving the required friction. The slices are further sawn into the shapes required to form the various parts of the design by iron or copper wire attached to bows, and always with the aid of emery. The finest emery powder (*poltiglia*) is used for polishing the surface of the stones, and emery is employed for grinding down the linings. For this purpose the work is placed on a fixed slab of marble or slate, iron plates of various sizes and thicknesses, according to the dimensions of the slab, and having wooden handles, being steadily worked over it by one or two men, as required. Sir Dominic Colnaghi says that it would be interesting to trace the origin of this art, and to follow its development from classic times, through Siena to the present style of work, which began to be practiced about the middle of the 16th century.

Portraits, landscapes, and architectural views were first produced, but it was soon felt that these subjects were unsuited to the materials employed. Decorative designs and imitations of fruits and flowers therefore took their place, and form the most successful subjects of modern works executed in *pietre dure*. It has been doubted whether the introduction of the art of working in mosaic into Florence, under the patronage of the grand dukes of the house of Medici, is due to Tuscan or Lombard artists, as it would appear to have flourished contemporaneously in both regions. While, however, it has died out—or nearly so—in Lombardy, it has survived in Tuscany, to become an important branch of Florentine industry. To provide stones for the works in real *pietre dure*, Europe, Asia, and the North of Africa have been laid under contribution, and the royal factory possesses a large collection of stones valued at some 20,000 lire. Among the principal stones employed are amethysts, agates, the sardonyx and chalcedony, flints, and many varieties of jasper, pebbles from the Arno (which generally contain a large proportion of lime), and petrified woods. Among the rocks which are chiefly used for works of decoration are red Oriental, Egyptian, and other granites, *verde di Corsica*, labradorite, antique porphyry, green porphyry, Oriental serpentine, jade, basalt, silicious breccia, and *lapis lazuli*. Black marble from Belgium is largely used as a foundation, and slate, as has already been mentioned, is employed as a lining for works in *commesso*.

The hardness of the materials employed, requiring patient industry to work them, accounts for the costliness of works in *pietre dure*, of which 75 to 80 per cent is attributed to labor. The commercial articles met with in the Florentine shops are chiefly composed of the softer qualities of calcareous stones, while shells are used for the white and pink tints, and coral is occasionally inserted. The workmanship, design, and effect are often excellent, but they are able to be produced at much less cost than the works executed at the royal factory, of which the following is a short notice. Although artists in mosaic had been employed by Duke Cosmo de Medici in previous years, the foundation of the royal factory of *pietre dure* in Florence may, perhaps, be considered to date from about the year 1754, when some rooms in the Casino di San Marco were assigned for the residence of the masters of the art. The factory was principally founded to carry out the works of the great sepulchral chapel of the Medici in S. Lorenzo. This chapel would appear always to have been intended to receive the monuments of the princes of the house of Medici, and never, as tradition avers, to become the receptacle of the tomb of our Lord, which was to have been conveyed to Florence from the Holy Land by the Druse Emir Faccardin (Fakhr-ed-Din). The slow progress of the chapel enabled the artists employed in the factory to execute other works, which were presented by the later Medici princes, on different occasions, to foreign sovereigns, thus extending the reputation of the factory.

Some of the artists appear to have tried their fortunes in foreign lands, and it is thought that a part at least of the works in *pietre dure*, executed in the Taj Mahal of Agra, are of Florentine origin. In 1723 a small factory was founded at Naples, which existed until 1860, when it was suppressed; but no rival rose to compete with Florence until the establishment of the imperial works at St. Petersburg for mosaic in relief, about the year 1840. The mosaics executed in the factory of the Vatican, at Rome, are of an entirely different character from the Florentine works in *commesso*. On the overthrow of the grand ducal government in 1860, the works of the Medicean chapel were suspended until the beginning of 1883. Since this date about 135 square meters of the pavement executed in *commesso* on a large scale have been completed. The total area of flooring of the octagon, excluding the recesses, is 642 square meters. The completion of the chapel has been intrusted by ministerial decree to the royal factory. The total cost up to the present time is estimated at 16,300,000 lire, or £625,000.

The average annual value of the production of the factory is calculated at 52,000 lire, of which about 12,000 represent works sold in Italy and abroad on private commissions, and the remainder in part works placed in the museum of the factory, and partly repairs in mosaics, etc., existing in the royal galleries of Florence, upon which the administration of the factory now depends. The works executed are marble table tops, panels for furniture, caskets, letter weights, decorated in *commesso*, both flat and in relief, vases, cups, statuettes, columns, and other ornamental works. At the present time, says Consul-General Colnaghi, a large piece is being executed, combining all the different kinds of works—*commesso, intarsio*, relief, and in the round. The work consists of a large black vase, richly decorated with flowers, fruit, birds, etc., and is the first example of *commesso* work applied to a curved surface. All the work is carried on by hand; there is no machinery, though this is much needed, it is said, in the sawing department.

For about two centuries and a half the production of the Florentine mosaics had remained a monopoly of the royal factory. It was not till 1825 that there was an industrial application of the art to small articles of jewelry and ornaments. To effect this, however, the true *pietra dura* had of necessity to be put on one side, and its place taken by calcareous stones and shells, thus allowing the work to be executed at reasonable rates. Between 1863 and 1873, the period when the city was the capital of Italy, there was especially a considerable increase in the industry. Since 1873 a variety of causes—such as the removal of the capital, the cholera (which caused a temporary diminution in the number of visitors to Florence), and changes of fashion—have led to a decrease in the production. The outfit of a mosaicist is very simple. With a small table, a basin of water, a brazier, a vise, some copper and iron blades to be used as files, a bow strung with iron wire, a little emery powder, and a few stones already cut into slices, which cost only a few francs, his equipment is complete.

Purification of Illuminating Gas by Means of Oxygen.

Oxygen produced by the Brin process is now being successfully used in gas works for gas purification. Mr. Valon, Ramsgate, who had abandoned lime purification because the gas works are situate in the center of the town, found that not only was the purification effected much more rapidly by using oxygen, but that only half the purifying space was required. The crude gas at Ramsgate contains 800 grains of sulphur per 100 feet of gas. This was reduced to eight grains, and the carbonic acid obliterated. The coals used at Ramsgate gave 10,000 cubic feet of gas per ton with a luminosity of 15½ candles. For the purpose of revivifying the gas about three-fourths of 1 per cent of atmospheric air was used, and the effect of this was to reduce the luminosity by 2½ candles. This luminosity was brought up by the introduction of 2½ to 3 per cent of cannel coal. When oxygen was introduced, Mr. Valon obtained from 3 to 3½ candles of increased luminosity. So that, by introducing oxygen into his gas, Mr. Valon is credited by Mr. E. B. Ellice Clark with having been able to abandon the use of cannel, reduce his sulphur compounds to three grains, and is now carrying on a series of experiments whereby he has thus far ascertained that he can make, instead of 10,000 cubic feet of gas per ton of coals, probably from 11,000 to 11,500 of the same luminosity.

H. M. S. Blake.

The first-class twin-screw cruiser Blake, which was successfully launched at Chatham on November 23, is, "beyond a peradventure," the most formidable of the greyhound series afloat in the British navy—or, rather, *will* be so when completed. Mr. White, the Director of Naval Construction, has jumped far ahead of all designs of a similar character now being brought forward, in his plans for the new vessel. While the Piemonte has only a displacement of 2,500 tons, although the speed is almost equivalent to that of the Blake, the latter possesses no less that 9,000 tons displacement, with the tremendous dimensions of 375 feet in length by 65 feet beam, and a draught of 25 feet 9 inches; thus affording a steady platform upon which her guns could be worked without intermission, while lighter cruisers were pitching and tossing around her, and only able to reply with an occasional shot.

The Blake is 75 feet longer than either of the belted cruisers. She is constructed of steel throughout, and has a powerfully armored turtle-back steel deck covering the magazines, torpedo rooms, engines, and boilers, a special protection for the tops of the cylinders being provided in dome-shaped steel shields, which rise above the protective deck. They are from 6 inches to 8 inches in thickness, the protective deck having a maximum thickness of 6 inches in the center, diminishing to 4 inches and 2 inches at the extremities of the vessel. The frame is particularly stout, and so combined with the steel armored deck as to afford facilities for ramming.

Nine thousand tons, projected at a speed of 22 knots against an enemy's vessel, would represent an impact that would be irresistible. A large space has been allotted for fuel. No less than 1,500 tons of coal can be carried, which will suffice for a distance of 15,000 knots at 10 knot speed, or 3,000 knots at the ordinary sea speed of 20 knots, expected to be attained. We should have mentioned that the conning tower is thickly plated with steel, and that special deflective shields will be fitted to the guns, to rotate with them, and entirely cover the breech and gun detachment. It is considered that the 6 inch steel deck plating will divert a projectile quite as effectually as 12 inch plating of a vertical nature. This, however, remains to be proved. The experiments on the Resistance, early in the year, were scarcely favorable, in their results, to the importance of turtle decks. The Blake has a double bottom —in this respect a vast improvement upon the Piemonte.

The machinery, which is being made by Maudslay & Co., will consist of two independent sets of triple-expansion engines of the vertical type, guaranteed to develop 20,000 horse power with forced draught, and, by means of twin screws, to drive the ship at a maximum rate of 22 knots. With natural draught the horse power is to be 13,000, and speed 20 knots. As plenty of space has been given to engines and boilers, and the forced draught is not to exceed an air pressure of 2 inches of water, it is probable that the expectations of the manufacturers will be fulfilled.

The Blake's armament, as originally designed, was to be two 9·2 in. 22 ton breech-loading steel guns, and ten 6 in. 5 ton 100 pounder quick-firing Armstrong steel guns, eighteen 3 pounder quick-firers, and four torpedo tubes. But it is doubtful now whether the 6 inch quick-firers will be placed in her, as the size, weight, and length of their projectiles makes them unhandy. The charge and projectile have to be handled separately, and this, to a great extent, neutralizes their value as quick-firers. Moreover, the sealing of the windage in such cases becomes a difficulty, and this has hitherto been found to be insuperable. It is all-important for a quick-firer that the powder gas should all act toward the muzzle of the gun. Hence, it is probable that the 4·7 inch quick-firing Armstrong steel gun, having a projectile of 45 pounds weight, and powder charge, made up into a regular cartridge, weighing about 70 pounds, already approved for service both in the army and navy, will be employed for the armament of the Blake. Four of these guns were mounted in the Teutonic at the recent naval review, and attracted so particularly the attention of the German emperor that he ordered several of them upon the spot. The 45 pounder has a piercing power up to 12 inches or 15 inches of armor plate, and twelve shots can be successfully fired per minute from it, only two men being required to work the gun. The 9·2 inch steel breech-loading gun is the most satisfactory of all heavy guns which have been built for some years. It has no tendency to "droop" at the muzzle, has a penetration power up to 18·8 inches of armor plate, and throws a projectile of 380 pounds weight at a muzzle velocity of 2,065 foot-seconds. We only regret that any heavier guns should have been constructed. They are perfectly unnecessary.

The Blake will cost £368,000 ($1,840,000). She will be employed as a swift cruiser to protect our commerce in the Atlantic and in Australasian waters, and her speed will enable her to keep pace with any liner afloat. Her sister ship, the Blenheim, is now under construction at Blackwall, the Thames Iron Works Company having contracted to deliver her shortly.—*The Engineer.*

PASSENGER SHIPS OF THE TRANSATLANTIC SERVICE.

In the year 1825 the voyage from England to India by steam was attempted. The paddle wheel steamer Enterprise, of 470 tons, with engines of 120 horse power, set sail under the stimulus of a premium of a lac of rupees, offered by the merchants of Calcutta for a successful trip. She carried no cargo, being limited in load to coal and stores. A quantity of the coal had been stored in bags on top of the boiler and caught fire during the voyage.

The average speed was five to six miles an hour, and after 114 days she reached India, having sailed forty and lain at anchor eleven days out of the total time. The attempt was an utter failure, but her commander, Lieutenant Johnstone, R.N., was rewarded for his services with £10,000.

Seven years later an American, Junius Smith, Doctor of Laws, was impressed by the length of two trips which he took across the Atlantic by sailing vessel; the first one to the east in 54 days, and a second trip, returning, in 32 days. He declared that "any ordinary sea-going steamer could do the distance in fifteen days with ease." He set about forming a company in London, and eventually organized one with a capital of £100,000, which built the British Queen, of 2,400 tons. She left London in July, 1839, and reached New York in fourteen days.

While she was building, the same company chartered the Sirius, 700 tons, which sailed from Cork, April 4, 1838. On April 8 a rival ship, the Great Western, 1,340 tons, left Bristol. Both reached New York on the same day, April 22, 1839, a little over fifty years ago, their respective times being 18 and 15 days. In that half century the time has been reduced to less than six days.

In 1840, the first Cunarder, named the Britannia, 1,200 tons registry, began to ply on the route between Liverpool, Halifax, and Boston. Mr. Cunard was on her on her first trip. Two years later Charles Dickens was a passenger, and describes the trip in his "American Notes."

The original steamers were driven by paddle wheels. Up to 1850 the Cunarders were wooden vessels, the largest 275 to 300 feet long, with wheels 32 to 36 feet in diameter. Their engines had a single cylinder about 90 inches in diameter and 8 to 9 feet stroke.

In 1852 iron ships were ordered for the first time by this company. In 1862 the Scotia, about 400 feet long, was built for the Cunard line, and was one of the last of the paddle wheel Atlantic high-class passenger ships. The single screw then held sway for a quarter of a century, and is well represented by the City of Rome, Alaska, and Etruria. The advent of the double screw is of very recent date among the ocean liners. The City of Paris, Teutonic, and Augusta Victoria represent the most advanced type of twin-screw ships.

The six vessels named are examples of the highest excellence yet attained in naval engineering. They form a fleet which, for speed, el·gance of appointment, and, above all, for reliability, are unequaled. The practice of five distinct transatlantic companies is illustrated by them.

The City of Rome, as her name to a certain extent discloses, was originally built for the Inman line, making her first trip in 1881; but after a few trips in this company's service she was transferred to the Anchor line, and is still in the service of that company. She can accommodate 271 cabin passengers and 1,500 emigrants. The saloon is 72 feet long and 52 feet wide, thus extending across the ship. Complete and ready for sea her estimated weight is 8,000 tons, and on 28 feet draught she displaces 13,500 tons, leaving a net carrying capacity of 5,500 tons dead weight. The bulkheads are numerous and provided with doors of the Admiralty pattern, provided with tell-tales on deck to show whether they are open or shut. For 150 feet aft from the stem she is double bottomed to prevent leakage in case of stranding. Nine keelsons run along her bottom, all carried unbroken through engine and boiler rooms. Her stern frame, weighing about 33 tons, was at the period of its construction the largest single forging of its kind ever made. She is driven by a single screw 24 feet in diameter, actuated by three compound tandem engines, with high pressure cylinders 43 inches, low pressure cylinders 86 inches diameter. The stroke is 6 feet. The crank shaft with three cranks at 120° set, is of Whitworth's fluid compressed steel, 24 and 25 inches in diameter. The intermediate shafting has a 14 inch hole through its center. Other and fuller particulars are given in the SCIENTIFIC AMERICAN of Sept. 11, 1880. She burns 185 tons of coal per day.

A few months after the City of Rome made her first passage to America, the Alaska began her work on the Guion line, and soon earned for herself the title, then unhackneyed, of the Ocean Greyhound. On her first trip she reached New York in December, 1881. She has a single screw, and her engine is of the direct-acting compound type, with one high pressure cylinder 68 inches, and two low pressure cylinders each 100 inches in diameter. The stroke is 6 feet. Boilers were adapted to carry 100 lb. of steam, and with the engines were calculated to develop 11,000 horse power. This at the time of her completion was the highest power of any steamer afloat. In February, 1882, she broke her rudder post while in mid-ocean on her way to America. On the day after the accident was discovered she sighted the steamer Lake Winnipeg, and took her in tow, with the object of being steered by her consort. This was successfully done, and port was reached on February 9, fifteen days from Queenstown. The occurrence was illustrated and described at length in these columns, March 7, 1882.

In September, 1884, the Etruria, built by John Elder & Co. for the Cunard line, was launched at Govan. Her engine is of the compound direct-acting type, with one high pressure cylinder 71 in. diameter and two low pressure cylinders each 105 in. in diameter and of 6 ft. stroke. An indicated horse power of 14,321 is claimed for her engines. On her first trip out she reached New York on May 5, 1885. On her trial trip she attained the speed of 23 miles per hour. She is a sister ship to the Umbria, and for several years alternated with the former in record breaking until the City of Paris left them both in the rear. She is lighted throughout, even to her shaft tunnel, with electricity. She has 72 furnaces. She can carry 720 saloon passengers. She cost about $1,600,000, and employs a crew of 287 men. Her machinery of 14,700 horse power weighs 1,800 tons, or at the rate of 8·2 horse power per ton. On account of her unprecedented record as a single screw ship, the following data as to her propeller are of special interest. Its material is cast steel. Diameter, 24 ft. 6 in.; pitch, 33 ft. 6 in.; area of blades, 226 square ft. Highest number of revolutions, 68¾ per minute; knots run in 24 hours 37 minutes, by observation, 503; same calculated from revolutions of screw 551, giving a positive slip of 8·7 per cent. The above records were obtained on a displacement of 11,000 tons, and with a development of 15,200 horse power; the speed was 20·3 knots per hour. She burns 315 tons of coal per day.

Up to this period the twin screw and closed stoke holes for artificial draught had not been adopted on the Atlantic liners. In two new steamers built by Messrs. James & George Thompson for the Inman line, these features were introduced. These ships were named the City of New York and the City of Paris. The latter one we illustrate. They are practically identical in size, appearance and dimensions. The City of Paris was launched on October 23, 1888, and first reached New York on April 11, 1889, after a trip of 6 days 18 hours 53 minutes. She has proved herself the fastest ocean steamship afloat. The hull is divided into 15 water-tight compartments. The doors in the bulkheads are above the load water line, so that the compartments will always be ready for protection. She has a double bottom with 4 feet distance between the two platings or skins; 1,600 tons of water ballast can be carried in this space. The rudder, of partially balanced type, is of such shape as to form a continuation of the lines of the hull when straight, and is so arranged as to keep all the steering machinery below the water line. Her twin screws are driven by triple expansion engines, high pressure cylinders 45 inches, intermediate cylinders 71 inches, and low pressure cylinders 113 inches diameter, and 5 feet stroke.

The Teutonic was built by Messrs. Harland & Wolff for the White Star line. She is the first ship completed under the new requirements of the British Admiralty, and is considered by some authorities the safest ship afloat. She is divided by eleven transverse bulkheads, fitted with doors self-closing by their own weight when liberated, and provided with glycerine cataracts or dash pots arranged to break their fall. If water enters the ship, it raises a float which trips the fastenings and causes the doors to close at once. She has twin screws, each actuated by a triple expansion engine with 43 inch high pressure, 68 inch intermediate and 110 inch low pressure cylinders. The stroke is five feet. All the machinery is below the water line. Forced draught is used, and the boilers can be worked up to 180 lb. pressure per square inch. The propellers are 21 feet 6 inches diameter, and 28 feet 6 inches pitch. The port propeller is left-handed and is 6 feet forward of the starboard one, which is right-handed, and they overlap each other 5 feet 6 inches. The top, therefore, of each screw works away from the ship's hull. The port propeller makes two revolutions a minute more than the starboard one. The ship provides accommodation for 450 cabin and 750 steerage passengers. The absence of cross-yards from her masts is noticeable. This is one of the Admiralty requirements. She carries six guns, and in event of war could be at once put into commission by the British government.

The Augusta Victoria is of special interest as being a product of the German ship yards. She was built at Stettin by the Vulcan Ship Building Co. for the Hamburg-American steamship line. She reached this port on her first trip May 19, 1889. She is also a twin screw steamer, a type which may now be regarded as established for first-class transatlantic ships. She has triple expansion engines, with high pressure cylinders 40 inches, intermediate 66 inches, and low pressure 101 inches diameter, developing 12,500 horse power, and her boilers consume 220 tons per day; she can carry 150 lb. of steam. An interesting feature of her construction is the use of a longitudinal bulkhead running from keel to deck and from bow to stern. The entire bottom is also double, and can receive 1,200 tons of water ballast. This in conjunction with her independent engines gives her a double guarantee of safety. In speed she compares with the Umbria or Etruria. On her trial trip she attained the speed of nearly 23 miles per hour. She burns 220 tons of coal per day.

The above six ships can run between America and Europe almost invariably under eight, and sometimes under six days. If we turn from these ships, built principally under commercial stimulus, to war ships, the difference presented is startling. Of all the powers, England has spent most money on her navy, and the United States are, in creating a navy, adhering closely to the type established by the ship yards of England and Scotland. Yet it may safely be said that there is no war ship afloat that could do the simple work of traveling across the ocean with the speed of any of the great liners, and independent of speed there would seem to be few that could do it much better than the old sailing vessels. The sea speed of their battle ships, as rated by the British Admiralty in 1888, varied from 10 up to 15·7 knots; of cruisers, from 12·5 up to 17·3 knots; but in the naval maneuvers this speed was not realized. Thus the Rupert, rated at 11½ knots, could not exceed 8 knots. The Shannon, rated at 10½ knots, kept up 9 knots with difficulty. The cruiser Mersey, rated at 16 knots, managed for a while when on special service to make 14½ knots, but eventually had to slow speed to clear her tubes and set things to rights generally. The Mercury, rated at 15·3 knots, was the only vessel capable of maintaining 16 knots for 48 consecutive hours. A great many of the ships broke down entirely under the test.

The lesson from the above is that in case of war the passenger ships of the various transatlantic companies will form a most valuable addition to the navy of Great Britain, and the naval wars of the future may be largely decided by such vessels as we have described.

The following presents some data of interest concerning the six steamers:

	Length.	Breadth.	Depth.	Tons.	Horse power.	Steam pressure.	Fastest trips eastward.	Fastest trips westward.
	ft.	ft. in.	ft. in.			lb.	d. h. m.	d. h. m.
City of Rome....	600	52 3	37	13,500	10,000	90	6 18 8	
Alaska	526	50 6	40 7	8,000	11,000	100	6 18 37	6 20 0
Etruria..........	520	57 3	41	9,860	14,700	110	6 4 40	6 1 55
City of Paris....	580	63 3	42	10,500	20,000	150	5 22 57	5 19 18
Teutonic.........	582	57 6	39 4	9,685	17,000	180	6 8 8	6 6 29
Augusta Victoria	460	56	38	10,000	12,500	150	No Queenstown record taken.	

American Geological Society.

There are two meetings in each year held by the American Geological Society, one in connection with the American Association for the Advancement of Science, and the other at some convenient place during the holidays. Accordingly the annual meeting will be held December 26, 27, 28, 1889, in the large hall of the American Museum of Natural History in New York City. The museum is at the intersection of 8th Avenue and 77th Street. The president is the venerable Professor James D. Dana, of Yale University. The secretary is Professor J. J. Stevenson, of the University of New York, from whom further information may be obtained. It may be added that numerous papers have already been offered as material from which a programme can be made out. Among the eminent names we notice those of Sir William Dawson, J. S Newberry, C. H. Hitchcock, A. Winchell, N. S. Shaler, G. F. Wright, H. S. Williams, Persifor Frazer, W. M. Davis, and A. S. Bickmore, all of whom have offered geological papers, from which a full and varied programme may be made out. Besides these there are several communications from Robert Bell and other scientific gentlemen of Canada concerning glacial phenomena occurring in Canada and Alaska.

THE SABER-TOOTHED TIGER.

The lion, tiger, and common cat are merely members of the same family (*Felidæ*) and of the same genus (*Felis*). Cats resembling those of the present time existed in the long past, the later Miocene and older Pliocene ages. The cave lion, *Felis spelæa*, and the *Felis media* are well known examples. In these species, as in all cats great and small now existing, the canine teeth were of moderate size, and were entirely or nearly concealed by the lips when the mouth was closed. Great cats with enormous canine teeth projecting from the upper jaw once roamed the earth, but have disappeared, leaving not a single analogous representative. These great-toothed cats have been called saber-toothed tigers (*Smilodon* and *Machærodus*). Their remains have been found both in the old and new worlds. Quite recently a species has been discovered in Florida, for which the name *Machærodus floridanus* has been proposed. The South American saber-toothed tiger has been described from specimens collected in the Pleistocene deposits of Brazil and of the Argentine Republic. Its huge teeth measure over seven inches in length, and the animal was about the size of a Bengal tiger. The formation of the jaws of these animals shows that probably they must have used their great teeth as daggers for ripping and thrusting instead of biting, for it was evidently impossible for them to open their jaws wide enough to free the lower jaw from the tips of the great upper canine teeth. Thus large pieces of flesh swallowed by them must have been taken into the mouth from the side, back of the canines, for only narrow pieces could be drawn in from the front, by the tongue. They were unable to seize hold of and carry their prey in their mouths in the manner of the cats now existing.

THE SABER-TOOTHED TIGER.

Another remarkable form, found in Oregon, is the dagger-toothed tiger, *Nimravus* of Professor Cope. The upper canines are long, dagger-like, and very straight. It was evidently a powerful animal, about the size of the jaguar.

The cat now existing which most resembles the *Machærodus* is the clouded or tree tiger of south-eastern Asia and Sumatra. Its canine teeth are long and curved, yet they do not extend below the lower jaw, and are but slightly exposed when the mouth is closed.

At the present time we find the great upper canines in one instance among the pinnipeds or seal order—the walrus, *Trichechus rosmarus*. Are we positive as to the direct benefit or use of these tusks to the walrus? One naturalist says they are used principally to aid the animal in mounting and clambering over blocks of ice. Another says they are used chiefly as picks in digging out of the mud and sand clams and other bivalves upon which it feeds. Still another says it is omnivorous, and in its stomach have been found remains of young seals, fish, shrimps, and other crustacea, while some assert that it feeds largely upon sea weeds.

In the musk deer (*Moschus moschiferus*) we also find a pair of long canines in the upper jaw, which in the males project outward below the chin. But of what use, if any, they are to the animal has never been clearly demonstrated.—*C. Few Seiss.*

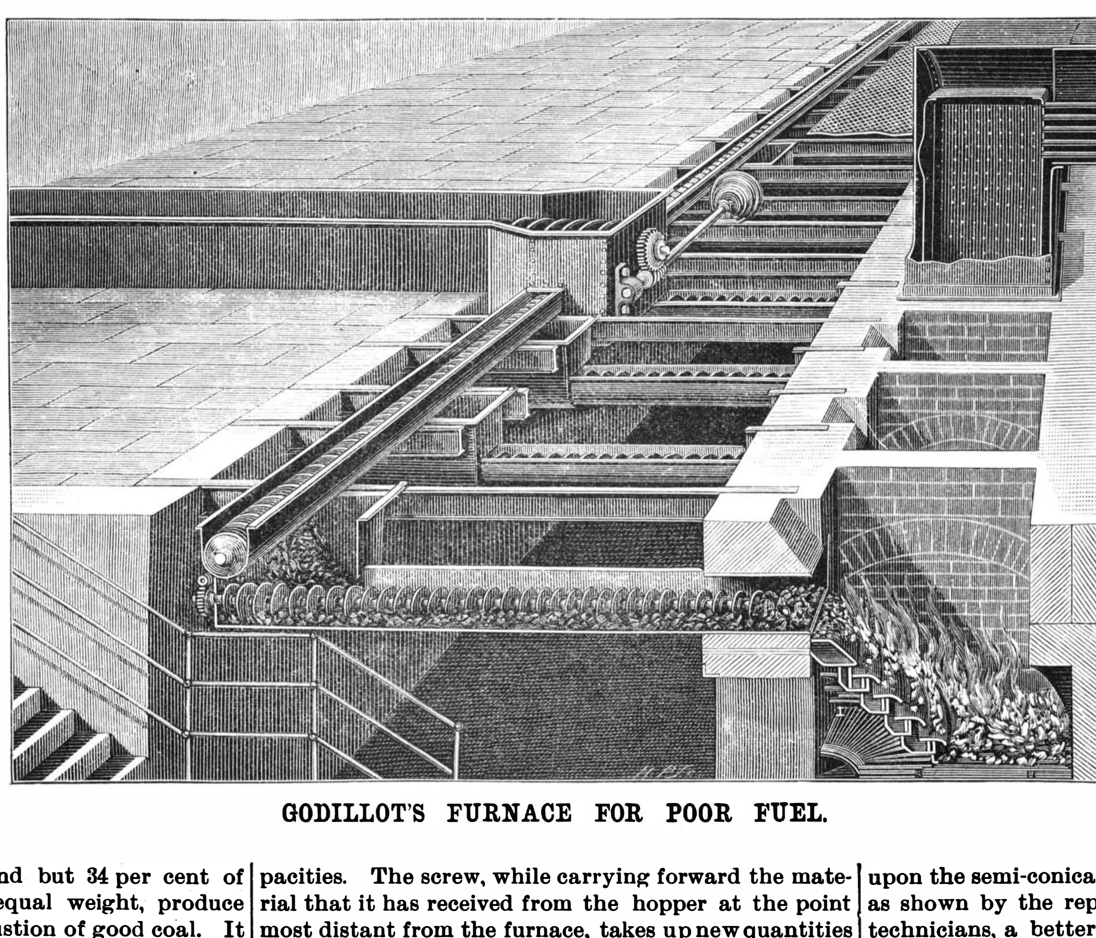
UTILIZATION OF POOR FUEL.

The utilization of poor fuels, which often constitute a cumbersome and worthless product of certain large industries, is a difficult problem, the solution of which has been sought for a long time. Ordinary grates are entirely inadequate for the proper burning of certain of these fuels, which, like the shavings left from the manufacture of extract of chestnut wood, for example, contain, after decoction, 66 per cent of moisture and but 34 per cent of ligneous material, and, at an equal weight, produce only a fifth of the heat of combustion of good coal. It takes 9 tons of humid tannate, occupying a volume of 700 cubic feet, or 4½ tons of bagasse, occupying a volume of 780 cubic feet, to produce the same quantity of heat that a ton of coal does. The combustion of these poor and bulky fuels can be effected only in a furnace that fulfills certain special conditions.

In the first place, it is necessary that the combustion shall take place upon superposed grates that permit the air to reach the fuel directly through the horizontal strata of quite wide section without allowing the smallest fragments of the fuel to pass. In the second place, it is necessary to effect a saving in the manual labor that would be occasioned by the charging by hand of great bulks of a poor fuel of slight density. Lastly, the combustion must not be interfered with by a frequent opening of the doors of the furnace.

Mr. Alexis Godillot has triumphed over all these difficulties by improving the grate arranged like steps (which has already been used for a long time for the burning of poor or small fuel) through the addition to it of a mechanical filling of the furnace. The grate has the form of a half cone resting upon its wide end. It is formed of semicircular horizontal bars, whose diameter increases from the apex to the base. These bars lap over one another, after the manner of the slats of a Venetian blind, and thus retain the finest particles. It suffices to direct a continuous flow of fuel upon the summit of the cone in order to have it distribute itself in all directions of the semi-circumference, and from thence to fall upon the flat plate at the bottom.

The continuous feeding is effected through the aid of a cast iron helix, which revolves mechanically (at a velocity that can be regulated) at the bottom of a hopper. In order that there may be no doubt about the fuel descending in the spaces between the threads of this screw, and that it may not clog them up, the body of the screw, instead of being cylindrical, has the form of a cone that tapers toward the furnace. In this way, the intervals between the threads present increasing capacities. The screw, while carrying forward the material that it has received from the hopper at the point most distant from the furnace, takes up new quantities of it throughout the entire length of the hopper.



GODILLOT'S FURNACE FOR POOR FUEL.

The system is, therefore, characterized by the form of the grate (that of a truncated cone) and its automatic feeding by a screw with increasing spaces between its threads. A damp fuel, carried to the summit of a grate of this kind already heated, is first dried, heated, and kindled, and then descends in a thin stratum in measure as that beneath gives way to it. It burns, owing to the air that reaches it through the bars, and finally reaches the horizontal grate, where the combustion is completed and the ashes accumulate. These ashes accumulate in the wide space between the grate in steps and the flat grate, and are removed, when the quantity becomes too great, through the aid of a poker. They fall into an ash pan beneath the conical grate. The draught is regulated by means of a damper.

The grate may be arranged under the boiler or in an independent furnace, whence the flames and products, upon issuing, pass over a bridge that separates the fireplace from the boiler flues. In this latter case, the losses of heat by the walls of the furnace are diminished by establishing around the latter a circulation of air that goes to the ash pan. The dome of the furnace contains two circular apertures, which are usually closed with covers. One of these is a sight hole, to allow the state of the fire to be examined, and the other, which is of larger diameter, serves for the introduction of fuel by hand in case there should be need to do so.

Mr. Godillot has, for four years, endeavored with energy and perseverance to find cases in which his grate might do good service, to adapt it to all situations and all kinds of fuel, and to get authentic information in regard to the results obtained in these various applications. The arrangement of the details varies according to the application and to the nature of the fuel to be utilized—sawdust, shavings, bagasse, etc.

In the works of Mr. J. Luc, of Nancy, for example, the daily consumption of 18 tons of coal has been saved by the burning of 134 tons of oak shavings from the extract works, and which, after the extraction of the tannin, contain 61 per cent of water. According to a report presented to the Societe d'Encouragement, by Mr. Brull, the quantity of steam produced by the different generators represents, on an average, eight-tenths of the heat disposable in the fuel.

The success obtained with fuels that are poor and not easily kindled has led Mr. Godillot to treat bulky and easily inflammable fuels in the same way—such, for example, as the shavings of planing machines and the waste from stripping flax, hemp, and ramie.

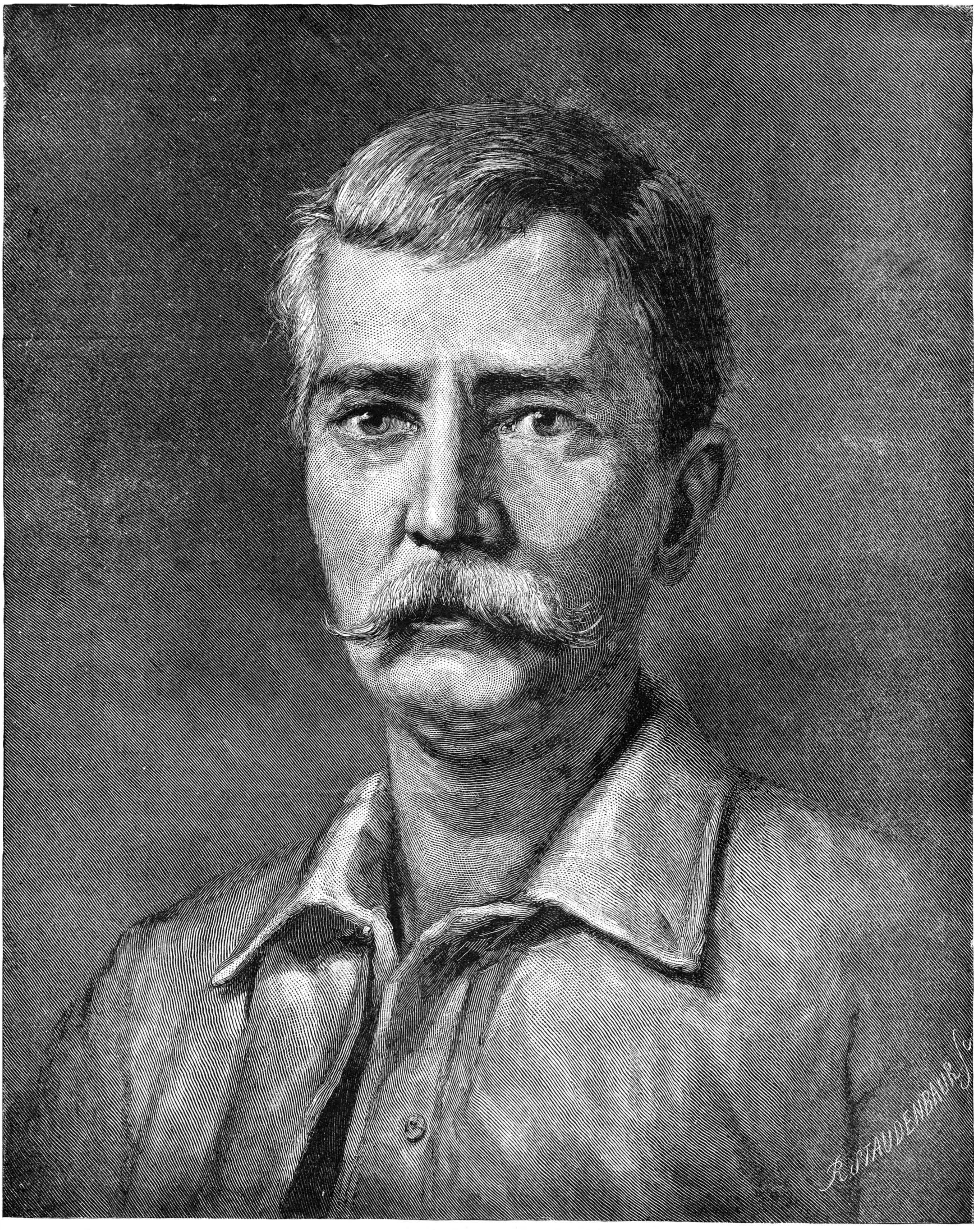
Finally, since methodical combustion gave so good results with poor fuels, it was naturally hoped that no less advantageous results might be obtained with rich ones. The results obtained have not deceived the inventor's expectation, but in these new conditions the combustion is so active that the grate cannot withstand the high temperature, and the coal sticks to the bars, thus rendering cleaning troublesome. These difficulties have been overcome by introducing a circulation of water between the bars. To this effect, each bar (as shown in the figure) is provided with a rib that enters a reservoir. The water introduced into the basin at the top descends in a cascade from reservoir to reservoir, and finally falls into the ash pan. It is possible thus to burn coal, coke, lignite, peat, etc., even in a state of powder.

A number of boilers heated with the Godillot furnace were shown at the exposition. As an example, we have selected the installation of Mr. Gramme's electric light station, in which there were established nine Davey-Paxman boilers, doing service for the luminous fountains. This service was particularly difficult on account of the supercharges of production during the operation, followed by sudden arrests during the intermissions. A glance at the figure will permit one to understand how the fuel, placed in a single conduit, is distributed mechanically to the nine boilers, and falls upon the semi-conical grate. In all these applications, as shown by the reports of competent and impartial technicians, a better performance, a simplification of the role of the fireman, and a complete burning of the smoke, has been obtained. The problem of the utilization of poor fuels is, therefore, now solved.—*La Nature.*

BELLITE is said to be 30 per cent stronger than dynamite, absolutely safe for transport, and flameless.

HENRY M. STANLEY.

The accompanying portrait of Henry M. Stanley was made after his return, in 1884, from the expedition for the exploration and organization of the territory of the Congo Free State, in which he had then been engaged for five years. We are indebted for the picture to the London *Illustrated News* of that period, and, allowing mons, the motto over the entrance to the government council chamber at Calcutta—*Mens æqua in arduis;* and with quite as much significance, to one whose career has been equally wonderful, though not tarnished by inhumanity to a lower race, may the motto be applied in description of the appearance of Henry M. Stanley.



HENRY M. STANLEY.

for the fact that the hair of the explorer has become nearly white, and his features more worn and weather-beaten, as reported by the cable accounts, it is not difficult to see in the resolute mien and resourceful expression which the artist has portrayed the hero now filling so large a space in the world's eye. In his review of the trial of Warren Hastings, who did so much to establish the British empire in India, Macaulay mentions, as peculiarly applicable to the distinguished civilian then brought to the bar of the House of Com-

Stanley was born in Denbigh, Wales, in 1840. His parents were named Rowlands, and, being exceedingly poor, they gave him to the care of the parish when he was three years old, and he was reared in the almshouse at St. Asaph. After obtaining a fair education here he taught school for a year or two, when he went as a cabin boy on a ship bound for New Orleans. Here he met a wealthy American merchant named Stanley, who adopted him, and he took the name of Henry Morton Stanley. He spent considerable time wandering afoot in the Indian country of the Southwest, but, his father dying intestate, he found himself poor again. On the breaking out of the war he was impressed into the rebel service, but escaped thence and served subsequently on the Northern side until the fall of Richmond, when he obtained employment as a reporter on the New York *Herald*.

His love of adventure was, however, overmastering, and he started soon to fight the Cretan army and to record its fate in the *Herald*. That over, he traveled through the Eastern countries and in Abyssinia and Spain as a roving correspondent until October, 1869, when Mr. Bennett sent him to find Livingstone. The story of that wonderful achievement is told in his book, one of the most fascinating records of exploration. Mr. Bennett sent him back to Africa almost immediately after his return from the Livingstone expedition, and

four years more were spent in travels and battles "through the dark continent." Then his great Congo undertaking occupied him from 1879 until 1884, the result of which was the establishment of an independent nation from the western coast of Africa at the mouth of the Congo to the 30th degree in the interior. When this was accomplished, loaded with honors, he returned to America, hoping to spend the balance of his life in less arduous labors.

But he had hardly reached American shores before the King of the Belgians and Sir William Mackinnon besought him over the cable to go and rescue Emin. Messages had reached Zanzibar and Europe from the Pasha's capital at Wadelai, indicating that he would be unable to hold his position against the Mahdi's threatened attack and was practically awaiting annihilation. Had he been willing to abandon his people, those of whom he had created a nation, he could easily have cut his way by some southern route to the coast before the Mahdi's forces could come down the Nile and get at him. But Emin preferred death to desertion. Indeed, when Stanley reached him, this sentiment, carried to almost Quixotic extremes, threatened to render the relief expedition unavailing.

Sir William Mackinnon is the president of the British East Africa Company, into whose service it is now desired to enlist Stanley and Emin both, but Stanley especially. Sir William secured subscribers to a relief fund, the Egyptian government giving a full third of the total presumed expense. Directly upon receiving the messages from King Leopold and Sir William, Stanley canceled his lecture engagements and hurried off to London. There the character of the errand he was desired to perform was fully made known to him. The expedition was not to be military. He was not to go in and drag out or anything of that kind. It was not known just what Emin's situation might be. His last letters had been quite hopeless in tone, telling of the submission to the Mahdi of all the territory north of his and of his fears that his own time would inevitably come. Stanley was asked, therefore, to conduct a caravan to Emin, laden with ammunition and supplies. If Emin wanted to come home, Stanley was to act as escort. If he wanted to stay and take his chances with the Mahdi, Stanley was to supply his necessities and come away. The scheme was thoroughly peaceful, and merely in the performance of the duty owed by civilization in general and Great Britain in particular to the intrepid man who was bravely upholding worthy interests in such an unequal contest.

How well Stanley has performed his work, through what hardships and privations he has struggled, and with what splendid success his labor has been crowned, as an explorer and pioneer in the opening of a vast and rich region in Central Africa, it would take a good sized volume to adequately set forth. Something of the nature of his task and how it was accomplished may be gathered from the letter written by him which appeared in our issue of December 14, but the full particulars will not be known until Stanley himself again gets back, and is able with maps and full details to supply the still wanting data to complete our knowledge.

Treatment of Carbuncle.

The following I have taken from the *Journal de Medecine de Bordeaux*, 1889, Nos. 38 and 39.

Drs. Arnozan, Lande, and Maurange have cited two cases of grave carbuncle cured by the subcutaneous injections of carbolic acid. They injected into the cellular tissue of the inflamed peripheric zone five grammes [illegible] composed as follows: Glycerine and distilled water, of each fifteen grammes; crystallized carbolic acid, three grammes. These injections were practiced at five different points circumscribing the inflamed region. They represent a total dose of fifty centigrammes of carbolic acid. The author affirms that under the influence of this medication the amelioration of the local and general state was prompt, as in twenty-four hours after the first injections the probability of a cure was manifest. In short, this treatment, which was introduced by Prof. Verneuil some time ago, is now generally adopted in the Paris hospitals.—*Alex. Boggs, M.D., Paris, Lancet.*

MULTNOMAH FALLS ON COLUMBIA RIVER.

One of the most beautiful features of the Columbia River is shown in the accompanying illustration. The Multnomah Falls are located about 32 miles from Portland, Oregon, and the water falls in an unbroken sheet a distance of 800 feet. The sensation experienced by a person standing on the bridge that spans the lower falls is in the highest degree awe-inspiring. The majesty of the falls themselves is enhanced by the magnificence and picturesqueness of the surrounding scenery.

MULTNOMAH FALLS ON COLUMBIA RIVER.

Hot Water Locomotives.

United States Vice-Consul Wood, of Batavia, island of Java, says:

"At the military station, at the northern point of Sumatra, there is an excellent steam tram-way in operation, similar to the lines in Sourabaya and Batavia. At the last mentioned place the track is about 7 miles in length, and extends through the principal streets of the city from the harbor to the suburbs, the tracks being double for the greater part of the distance. The locomotives are from the German works at Dusseldorf. They are provided with steam at the termini from stationary boilers. The steam enters the boilers at 200 pounds pressure, and this supply proves sufficient for maintaining, with a train of four tram-cars, an average speed of 10 miles an hour, with stops at stations about half a kilometer apart. A dividend of 6 per cent is declared annually."

The Temperature of Deep Oil and Gas Wells.

In the course of the report presented at the recent meeting of the British Association by the Committee on Underground Temperatures, it was stated that the Secretary (Professor Everett) had been in correspondence with Mr. G. Westinghouse, Jr., of Pittsburg, president of the Philadelphia Company, with the view of obtaining observations of temperature from some of the deep oil and gas wells belonging to the company. Mr. Westinghouse intrusted the observations to Mr. A. Cummins, the company's mining engineer and geologist. Some attempts were made at observation; but, owing to press of business, they were not thoroughly carried out. The most successful attempt was made in a well at Homewood, in the city of Pittsburg, known as the Dilworth well, where the following results were obtained: At a depth of 3,600 feet, the temperature was 96° Fahr.; the air at the surface being 70° Fahr. At 3,710 feet the temperature was 89°; air at surface, 76°. Going deeper, we have the following figures: 3,920 feet, 102°; 4,002 feet, 108°; 4,215 feet, 111°; 4,295 feet, 114°—the air temperature being respectively 60° in the first case and 62° in the rest. The thermometer remained only from five to ten minutes during each test; and as there were only 40 feet of water in the well, the observations must have been taken in air. The diameter of the well was six inches. The mean air temperature at Pittsburg is 52° Fahr.; and the height above sea level about 900 feet. Comparison of the mean surface temperature (taken as 52°) with the temperature of 114° recorded at 4,295 feet shows an increase of 62°, which is at the rate of 1° Fahr. for 69·3 feet. But comparisons of the observations *inter se* would give a rate about twice as rapid as this; hence no safe conclusion can be drawn. Mr. Cummins hopes shortly to get the temperature of some deep wells in a way that will be satisfactory.

The Flour Moth.

In Ontario, says the Toronto *Globe*, a new insect has appeared — the flour moth (*Ephestia kuhniella*), which promises serious trouble and injury to millers and all others whose business it is to handle flour. The Ontario board of health has issued a pamphlet containing a description and cuts of the moth, an account of its ravages, and advice as to the best measures for its extermination. The moth, it is said, came in with milled goods imported as food for children from a port on the Mediterranean, of whose coast it is a dreaded scourge. Its first appearance was in the month of March, 1889, when a single moth was seen flying near the Ontario mill. In July the moths and worms became so numerous that the mill was shut down. Later the work of taking remedial measures, however, fell to the Ontario government. Mr. Blue, the deputy minister of agriculture for Ontario, visited the mill and called in Dr. Bryce, secretary of the provincial board of health, who dealt thoroughly with the question of prevention. He advocates "a rigorous quarantine of grains coming from Mediterranean ports," and advises every miller to become thoroughly acquainted with the appearance and habits of this moth, and to destroy any that he sees.

THE citizens of Somerset, a town 10 miles south of Wabash, Ind., were startled one morning recently, when the fires in their natural gas stoves went out. Investigation showed that the gas in the great Jumbo well, which supplies the town, and which had been sunk 30 ft. into Trenton Rock, had given out completely; not a smell of the fluid remained. This is the first powerful well that has failed in this section of Indiana. Another well will be put down at once.

RECENTLY PATENTED INVENTIONS.

Engineering.

BOILER. — James R. Lutgen, Brock, Neb. This invention relates to sectional boilers, and provides a simple and durable construction designed to facilitate the getting up of steam rapidly, in which the steam will be superheated, while the danger of explosion is lessened on account of the steam and water being equally divided, and a bursting or fracture of one of the sections of one of the interior pipes would not allow the steam to escape instantly.

HYDROCARBON BURNER. — Frank B. Meyers, Fort Plain, N. Y. This is an improvement on a former patented invention of the same inventor, making a burner simple and durable in construction and easily adapted to a furnace, and whereby the quantity of oil and air to be mixed can be conveniently regulated, to insure complete combustion.

Railway Appliances.

CAR COUPLING.—Henry E. Spilman, Spilman, West Va. The sides of the drawhead have openings to permit the insertion of coupling jaws, which are vertically pivoted at their outer ends to the drawhead, and incline convergently to their inner ends, which are adapted to engage the coupling bar, with other novel features, whereby cars may be automatically coupled, and may be uncoupled from the side of the car.

METALLIC RAILWAY TIE. — John Caseley, Knightstown, Ind. This tie is made with two base plates having downwardly curved ends and struck up tongues to rest against the outer sides of the rails, a connecting rod or bar joining each pair of base plates and secured in such position by means of studs extending through recesses from which the tongues are struck up, the rod also having overhanging noses to rest on the rail flanges.

CAR AXLE LUBRICATOR. — Joseph Wood, Red Bank, N. J. An oil receptacle is, by this invention, held in the car axle box, and provided with a curved top on which a wick rests, extending at its ends into the receptacle, the wick being always in contact with the journal and extending at all times into the lubricant in the receptacle.

Mechanical.

AUGER HANDLE.—Lewis E. Page and Charles W. Andrews, Allentown, N. Y. This handle is hollow, having a stationary socket with inclined inner faces and threaded turret, with centrally pivoted semicircular clamps and a clamping screw, the mechanism being arranged to hold augers or bits of any size straight and firm by a combined wedge, screw and lever power.

CAN MAKING MACHINE. — Ambrose A. Tripold and Benjamin Blumenschein, Brooklyn, N. Y. This invention covers improvements in machines for making metal cans where seamers or squeezers are employed to secure the top and bottom of the can to the body, the invention covering novel features of construction and the combination of parts whereby the manufacture may be conducted with economy of time and labor.

KNITTING MACHINES. — Joseph D. Partello and John F. Jackson, Rochester, Mich. This invention covers an attachment by means of which a tufting yarn may be knitted in with the stitches of the ordinary knitted fabric and carried to the inside surface, and either cut or left in the form of loops, there being an upper needle and cam cylinder, whereby the tufting yarn will be carried in advance of the knitting yarn, whichever way the machine is turned.

Agricultural.

HARROW TOOTH.—Robert G. Culbertson, near Hale, Mo. The main blade has a backward sweep or curve, with a curved cutting edge turned to one side at the lower end or point of the tooth, and an upright shank at the upper end to enter the beam and to adapt the tooth to be axially adjusted to reduce or increase its penetration, and also to adapt it to act as a smoothing point.

LANDSIDE FOR PLOWS. — James T. Tapper, Sandersville, Ga. This is a plate with a curved front edge and with lugs, and an L-shaped shoe to which the plate is secured, making a landside which can be readily attached to or detached from an ordinary plow stock, irrespective of the curve of the stock, and held in a firm and rigid position by a single bolt.

Miscellaneous.

OVERSHOE.—Joseph S. O'Hara, Grand Rapids, Mich. This is an elastic overshoe designed to be neat in appearance and easy to manufacture by the usual processes, but which is peculiarly formed to hold itself securely upon the leather shoe of a wearer without undue strain upon the front portion of the foot.

SPEAKING TUBES. — Richard Walsh, New York City. This invention covers a sound receiver for tubes or trumpets used to improved the hearing, the receiver having corkwood inner face or lining and a longitudinal corkwood partition, combined with a tube having a metallic inner lining with which the corkwood inner lining communicates.

GRAIN SEPARATOR.—Albert J. Etzold, Detroit, Mich. This separator is designed to provide the greatest possible area of screens and sieves, so constructed that they may be readily cleaned, and the meshes or perforations are not likely to become clogged, while the screens or sieves and imperforate drums may be quickly and conveniently adjusted, removed, and replaced.

HAY AND GRAIN STACKER. — Francis M. Cropp, Severance, Kansas. This invention provides an elevating device capable of being conveniently and expeditiously attached to or detached from a stacker, the device being of simple construction and embracing a novel combination of parts.

AIR COMPRESSOR. — Joseph Weyand, Guttenberg, N. J., and William Lang, New York City. This is a hydraulic air compressor designed to work automatically to supply and maintain a predetermined amount of air pressure upon liquids stored in casks or tanks, in cellars, etc., to force the liquids through suitable discharge pipes to the floor above, where they may be conveniently drawn by a faucet.

BALING PRESS ATTACHMENT. — William C. Hackett, Greenville, Miss. This is an attachment for removing and heading up bales, there being combined with the press a shaft with sheaves of two diameters, the smaller sheave connected with the piston of the baling press by a cable and the larger sheave having a cable or chain attached to tongs or hooks for withdrawing the bales from the press and heading them up.

VEHICLE WHEEL. — Progore P. De Bogory, Geneva, Fla. Combined with the hub is a series of spring metal loops forming spokes, each loop being connected at both of its ends to the hub, while a flexible tire incloses the outer bowed portions of the loops, making a wheel which will yield with the load, and present to the road a larger contact surface than the ordinary wheel.

TRACE ATTACHMENT.—William F. Turman, Weatherford, Texas. This invention covers an improvement in couplings for tug straps, whereby the tug strap may be expeditiously attached to the cockeye of the whiffletree or detached therefrom, the device being simple, economical, and durable, and easily manipulated.

FILTER AND WATER PURIFIER. — Frederick Stiles, Burnet, Texas. This invention covers a combination of a pump, filter, and air pump, the filter and purifier designed to be placed in the bottom of a well or cistern to filter the water before it is pumped up, and also to purify the water in the well by forcing air into it.

HANGING LAMP ADJUSTER. — William F. Bradner, Greeley, Col. Combined with a central drum and smaller side drums are connected suspending strands, the casing or frame in which the drums are mounted having top openings over the small drums through which the strands pass in frictional contact, and a bottom opening under the larger drum through which the lamp strand passes in frictional contact with the side or wall from the larger pulley.

ADJUSTABLE LAMP HANGER.—This is also the invention of the same inventor, covering the general features of a suspending cable or cord having interposed in its length a differential pulley with peripheries of different diameters, from one of which the cable extends to the ceiling, and from the other to the lamp, the pulley forming a weight which, by the balancing effect of the two pulley surfaces, serves to hold the lamp to any adjustment without special appliances.

FENCE LOOM. — Oscar S. Bocker, Toquerville, Utah Ter. This is a machine for making combined picket and wire fences, in which the wires between which the slats are secured are fed through hollow twisting spindles from spools mounted in spool carriers which are connected to and revolve with the spindles, the spindles being arranged to be rotated in opposite directions as desired, with devices for forcing the pickets firmly in place and holding them while the wires are being twisted.

HEAD FOR POLISHING STONE. — John Klar, Westfield, Mass. This head is preferably made of a series of spaced concentric rings usually cast integral with the upper cross bar, blocks of wood being secured between the rings, and the spaces being adapted to receive a plaster of Paris filling, while the central space is left open for the admission of water to the stone to be ground when the head is in operation.

BRICK CARRIER. — James H. Steele, Butte City, Montana. This carrier comprises belts and means for revolving their pulleys, in combination with a guide, and a series of transfer rollers at the contiguous ends of the belts, whereby moulded bricks may be carried from the brick press to the yard.

HOOP OR TRUSS ROD LOCK.—Rasmus Olsen, Central City, Neb. This fastening is designed to be subjected to a central draught or strain, whereby the liability of the breaking of the rod or hoop is decreased, the rod or hoop having a loop at one end, a thread at the other, a block receiving the threaded end, and having a shoulder for engagement with the loop, and a nut adapted to engage the threaded end and tighten it.

SAW JOINTER. — John F. Coleman, Barfield, Ark. A vertically sliding or adjustable plate is held to a filing post above a circular saw to be jointed, this plate having a horizontal part holding a block with guideways for a sliding block on the lower side of which is secured a suitable file, the teeth of which, when the saw is placed on the filing post, are cut down by reciprocating the sliding block to which the file is attached.

PARTITION WALL. — James M. Sinclair, New York City. This partition is made with standards provided with attached transverse bearing bars at intervals, and transverse tie or panel bars, etc., making a portable partition wall, which may be fireproof if desired, to be quickly and conveniently erected in any room, and readily removed, without injury to the side walls or the ceiling.

MASON'S HAWK. — George Kautz, Albany, and Lewis A. Kautz, Hoosick Falls, N. Y. This is a device designed to provide an implement for holding mortar, having a table of uniform thickness, of which the handle may be readily attached and detached, and which, when attached, will be firmly and rigidly held.

WEIGHING SCALES.—George W. Craig, Charleston, West Va. This invention covers improvements in scales especially intended for use in weighing railway cars, locomotives, heavy wagons, and other large heavy bodies, the invention covering various novel features in construction and the combination of parts.

ADJUSTABLE MEASURE. — Charles W. Sampson, Danville, Va. This measure has a movable bottom, with projections adapted to engage with a series of notches or depressions in the body of the measure, whereby the measure can be quickly adjusted to measure different quantities, as pecks, half pecks, etc., and will be especially adapted for grocers' use.

SEPARATING METALS. — Pedro del Valle, Mexico, Mexico. Two patents have been granted this inventor, in one of which is covered a process of separating and amalgamating metals by establishing a downward circulation of mercury through an ascending stream of pulverized ore, and eliminating or drawing off the heavier metals and amalgams which gravitate out of the circulation, while in the other is embraced a process of effecting an intimate contact between the pulverized ore and mercury, and separating the ore into grades of varying degrees of richness, by causing an ascending stream of the ore to pass crosswise or laterally through a circulating stream of mercury.

SEPARATING SOLDER FROM TINNED IRON.—William E. Harris, New York City. This is effected under this invention by coating tinned iron carrying the solder with petroleum, and burning the petroleum to smut the iron and melt the solder, causing the molten solder to run off from the smutted metal, and separately removing the tinned iron and solder from the receptacle.

BRIDLE BIT.—Clarke P. Pond, Olena, Ohio. This bit has a bar or mouth piece of which one side is round and smooth, and covered with soft or elastic material, and its opposite side or end of hard material, with sharp edges or projections, to prevent side pulling with horses having one side of the mouth tougher than the other.

VEHICLE SPRING.—Joseph H. Deniger, Bridgeport, Conn. This spring consists of parallel round bars curved from center to their ends, where they are connected by plates curved to correspond to the curvature, the plates having their ends formed into a coupling, while head plates are secured to the top and bottom surfaces of the bars at their centers, making a light and strong spring no portion of which is weakened by bolts.

HAY PRESS. — Leonidas L. Moe, Denver, Col. This is a baling press providing for two or more reciprocations of the follower for each revolution of the sweep, a stem carrying a cam being arranged in connection with the follower, the sweep carrying a head, and rolls or projections carried by the sweep head being arranged to bear against the stem cam.

GLOVE FASTENER.—George W. Jackman, Littleton, N. H. The glove has a slit or opening in its wrist portion and a pocket extending around to near opposite sides of the slit, while a cord, tape, or string is attached at its one end to the glove and passed across the slit and around the pocket, to come out at the opposite end.

ADJUSTABLE HAT MARK. — George B. Foote, Helena, Montana. This is a strap or ribbon on which the name of the owner may be written, having one end attached at one side of a hat, and adjustably secured in a catch or friction clasp on the opposite side, whereby the strap or ribbon may rest loosely in the hat or be stretched across it, to bring the name into prominence and prevent the hat being worn until the ribbon is loosened.

TOOTH BRUSH. — Belle V. Cushman, New York City. In this brush the handle carries at one end the brush bristles in the usual way, while the other end of the handle has a cavity forming a spoon, adapted to conveniently remove the tooth powder from its box for use.

PHOTOGRAPHIC CAMERA.—August and Louis Chronik, New York City. This invention covers a photographic camera shutter designed to be easily regulated and not jar the camera when operated, while serving to make any desired time exposure, or a slow or rapid instantaneous exposure.

FREEZER OR REFRIGERATOR. — Michael Moncion, Ogdensburg, N. Y. Combined with a double-walled outer case filled with non-conducting material is a salt tank or chamber arranged within the case, a refrigerator or ice chamber inside of the salt tank, and a central cooling chamber, the apparatus being designed for use to make ice and to preserve articles of food.

MILK COOLER. — Louis H. Porter, Rockdale, Texas. According to this invention, the bucket or churn holding the milk or other article to be cooled is wrapped in some textile material, and around its upper end is bent a tube having a series of perforations, water being supplied from a reservoir to cause a constant gentle trickling on the textile covering of the receptacle, the invention covering a novel combination and arrangement of parts for such an apparatus.

VENDING APPARATUS.—Lincoln Smith, Niantic, Conn. This invention covers a novel construction, combination, and arrangement of parts, in an apparatus designed, upon the deposit of a coin of predetermined value, to deliver a certain quantity of merchandise, the invention relating more particularly to an apparatus for dispensing beverages.

DISPLAY BOX.—Max Rubin, New York City. This box has a body part and a slip cover, so arranged that when the box is opened the cover may be adjusted upright at one end of the body, or in a flat position back of the body, or the attached body part, with its open face uppermost, may be adjusted to sit down in or on top of the open face portion of the cover, the box being adapted for displaying various articles of merchandise.

PADLOCK COVER.—Robert A. Wilson, Lexington, Mo. This cover has an inclined front portion and triangular sides hinged about its upper end, with means for connecting it to the door jamb or post, so it may be conveniently raised to give access to the lock, the cover being for protecting outdoor padlocks from rain, snow, ice, etc.

HAND TACKING IMPLEMENT.—Charles A. Millener and William D. McRae, Deseronto, Ontario, Canada. This invention provides an implement whereby tacks or nails will be consecutively fed from a receptacle beneath a plunger, and be automatically placed in position to be driven by the plunger when a downward stroke is imparted to the latter.

CAKE OR CRACKER BOX.—Ferdinand Miller, Covington, Ky. This invention provides for such a construction of a cracker or cake box that the lid may be used to hold and exhibit small cakes or crackers, while the receptacle may be securely closed, and also allow access to be had thereto when a number of boxes are piled one above the other.

WASHING MACHINE.—Lewis N. Campbell and John Pyle, Wilmington, Del. This machine is designed to be simple and durable in construction, and very effective, being self-feeding, and so arranged that the operator is enabled to direct the rubbing to any particular spot on the clothing for any desired length of time.

EXTENSION TABLE. — George Schmitt, New York City. This is a table more especially adapted for dining rooms, but also applicable for other service, the invention covering novel features of construction and the combination of parts designed to afford a simple, substantial, and readily adjustable table.

CONDIMENT RECEPTACLE. — George Schmitt, New York City. This is a folding receptacle for holding salt, pepper, etc., for table use, to be folded up when not in use to protect the condiments from dust and from spilling, while presenting an attractive appearance in either folded or unfolded position.

GOLD AND SILVER FINDER. — An English patent has been obtained by Mr. S. A. Goodman, Jr., of Tyler, Texas, for what is claimed to be an improved means of detecting gold and silver underground, the device consisting of a sealed vial or flask in which certain substances are placed, and the vial or flask is then suspended by a cord in the neighborhood where the metals are sought.

Business and Personal.

The charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

NEW BOOKS AND PUBLICATIONS.

THE TEACHER'S MANUAL OF GEOGRAPHY. By Jacques W. Redway. And Topics in Geography. By W. F. Nichols, A.M. Boston: D. C. Heath & Co. Pp. 174. Price 55 cents each.

These two little works are, as their titles sufficiently indicate, designed for teachers' use. The first one, however, will be found exceedingly interesting for all of us; and while the second is, of course, decidedly more technical in character, it would form as it stands an interesting supplement for the first. As a popular work, therefore, which few could read without improvement, we should unhesitatingly recommend the first of these to general perusal. Both of them would seem to be almost a necessity for the advanced teacher.

EVOLUTION OF THE ELECTRIC INCANDESCENT LAMP. By Franklin Leonard Pope. Elizabeth, N. J.: Henry Cook, publisher. 1889. Pp. 91.

The history of the evolution of the incandescent light, viewed largely from the standpoint of the inventor and patent expert, is contained in this book. Numerous illustrations, extracts from patents, and claims of the rival inventors are given. At the beginning is published the chronology of the modern incandescent light, beginning with the inventions of J. W. Starr, of Cincinnati, 1845, and ending with the modern court decisions up to August 8, 1889. The especial interest of the book is that it gives much matter useful for the study and appreciation of the recent decision [illegible] in the case of the Consolidated Electric Light Company *vs.* the McKeesport Light Company, by Justice Bradley, at Pittsburg, October 5, 1889.

MANUAL OF ASSAYING GOLD, SILVER, COPPER, AND LEAD ORES. By Walter Lee Brown, B.Sc. Third edition. Chicago: E. H. Sargent & Co. 1889. Pp. 487. Price $2.50.

The formation of fluxes and all needful information in regard to the assaying of ores and metals by fire assay is contained in this book. Various interesting points in regard to improved assaying furnaces and tools indicate the important advances of the last few years. A colored plate of scorifier colors, showing how the interior of the scorifier indicates the character of the ore, is of special interest and novelty.

WOOD'S MEDICAL AND SURGICAL MONOGRAPHS. William Wood & Co., New York. Published monthly. Price $10 per year, single copy $1.

This very elegant publication, with colored illustrations and other plates where required, by the liveness of its topics and the eminence of the authors treating them, occupies a very high standpoint in the medical world. It assumes to a certain extent the character of a medical review, as all of the articles are of such length and completeness as to deserve the title of "monograph," awarded them by the publishers. We can but recommend it to all advanced physicians as well worthy of their attention. The twelve volumes published during one year will form a very extensive collection, as a single copy contains about 300 pages.

ELECTRICITY IN OUR HOMES AND WORKSHOPS. By Sydney F. Walker. London: Whittaker & Co. New York: D. Van Nostrand Company. 1889. Pp. xv, 320. Price $1.50.

Minor or auxiliary electrical apparatus form the subject of this work. Telephones, electric lighting, signals, electric bells, and galvanic batteries are the principal subjects treated, being preceded by a glossary of terms, being a short statement of the meaning of the modern terms of electricity and magnetism. The work is illustrated wherever necessary, and forms an interesting addition to the more popular electrical literature.

FIRES IN THEATERS. By Eyre M. Shaw. Second edition. E. & F. N. Spon, London and New York. 1889. Pp. xv, 86. Price $1.25.

A member of the London Fire Brigade treats in this book of fires in theaters, of their causes, peculiarities, and how to avoid them, with a somewhat detailed account of the fires of special importance, supplemented by a list, collected with much care, of the theaters destroyed by fire. These tables are of the highest interest, although value would have been added to them had the number of deaths in each instance, as far as ascertained, been given. The total number of deaths, however, for each year is given, in a tabulated summary, from 1876 to 1888.

JOURNAL AND PROCEEDINGS OF THE ROYAL SOCIETY OF NEW SOUTH WALES. Edited by the Honorable Secretaries. Sydney, London.

The scientific life of the antipodes is well exemplified in the work before us, the journal and proceedings of the Royal Society. In it meteorology, geology, and physics are all given a place, and evince much ability and thoroughness on the part of authors and compilers.

ELEVENTH ANNUAL REPORT OF THE BUREAU OF STATISTICS OF LABOR AND INDUSTRIES OF NEW JERSEY. Trenton, N. J. 1889. Pp. xix, 648.

The State of New Jersey has acquired a just reputation for the value and high standard of its official publications, and the present work fully justifies this reputation. It contains the statistics of the labor and industries, railroad casualties, employers' liabilities, wages and labor data, and one important section is devoted to the co-operative building and loan associations which now form so large an element of the building and economic life of New Jersey. The school statistics are given a place, while a chapter on labor legislation, including several acts of the legislature, is printed at the end of the book.

CIVIL AND MECHANICAL ENGINEERING POPULARLY AND SOCIALLY CONSIDERED. By J. W. C. Haldane, C.E. and M.E. Second edition. London: E. & F. N. Spon. New York. 1890. Pp. xvii, 490. Price $4.50.

The present work appears in a second edition of much improved form and materially enlarged. It has already been reviewed in these columns, when we noted the graphic description of the life of a mechanical engineer and of the achievements of such a career. The volume is exceedingly interesting, and forms excellent reading for the popular as well as the scientific world. It is finely illustrated.

A TREATISE ON STEAM BOILERS. Their strength, construction, and economical working. By Robert Wilson, C. E. New York: John Wiley & Sons. 1889. Pp. 36a, 457.

The present work, well known abroad, is reprinted from the fifth English edition by Professor Flather of the Lehigh University. While the text of the original volume is given in full, an introductory portion numbered from 1a to 36a is published as a species of supplement to the American edition, illustrative of the topic of steam boilers. The work is excellent and goes into great detail as regards the manufacture, care and working of steam boilers.

Received.

MY GOOD FRIEND. By Adolph Belot. Translated by Edward Wakefield. Worthington & Co., New York City. The Bemen Library. Paper 25 cents.

USEFUL HINTS ON STEAM. By E. E. Roberts (formerly U. S. N.), 107 Liberty Street, N. Y. 90 pages. Paper cover.

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Notes & Queries

HINTS TO CORRESPONDENTS.

Names and Address must accompany all letters, or no attention will be paid thereto. This is for our information, and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all, either by letter or in this department, each must take his turn.

Special Written Information on matters of personal rather than general interest cannot be expected without remuneration.

Scientific American Supplements referred to may be had at the office. Price 10 cents each.

Books referred to promptly supplied on receipt of price.

Minerals sent for examination should be distinctly marked or labeled.

(1623) F. G. K. writes: 1. How is tracing paper and tracing cloth made? A. For tracing paper treat the paper with boiled linseed oil, and remove the excess of oil with benzine. It may be further improved by washing with chlorine water, followed by solution of binoxide of hydrogen. For tracing cloth thin, linen is coated with starch, then with linseed oil thinned with benzine, and is finished by being passed through polished rollers. 2. How transfer or carbon paper is manufactured. A. Mix lard with excess of lampblack and coat the sheet. Beeswax and lard oil may be used as the vehicle, with logwood extract precipitated with iron sulphate as the pigment. 3. How much power would a turbine water motor develop with 90 feet water fall, the wheel being 4 feet in diameter? A. 2000 h. p.

(1624) J. J. M.—The sample sent is principally carbonate of lime; probably of little or no value. It might be of local use as a fertilizer.

(1625) J. N. S. asks whether salt used in a steam sectional boiler for the purpose of preventing rupture by freezing is injurious to the boiler, and if it will not prevent the powerful expansion occurring by the freezing of pure water? The sections are cast iron and 6 in. in diameter, and from 40 to 80 lb. pressure is carried on the boiler, but it stands idle several days at a time frequently. I know that W. B. Smith, maker of a high pressure hot water heater, has used salt for a long time, and I presume is using it yet on his car-heating apparatus. A. Salt in a boiler will prevent freezing, but retards somewhat the generation of steam, as salt water boils at a higher temperature than fresh. In small quantities it will not injure the cast iron boiler. It is used in the boilers of sea-going steamers. You can charge the boiler with from 4 to 5 per cent of the weight of the whole of the water in the boiler with salt and feed fresh water to replace the steam used. If the boiler is used for steam heating, the salt will not prevent the return pipes from freezing, as the water from the condensing steam will always be fresh. The brine used in hot water circulation penetrates all the pipes, and thus prevents freezing, as in the car-heating systems.

(1626) W. E. H., in answer to J. P. T. (No. 1490, November 16), for instruction to enable him to cut coarse thread or spiral on his lathe. Let him put his largest gear on the spindle, his smallest on the feed screw, the next smallest on the movable stud to engage with the largest, and the next largest also on the stud to engage with the smallest or feed screw gear. Any of the amateur lathes will give him substantially what he wants. Of course, he must take a light cut, as the leverage against him is enormous. It is well to use the "back gears" in driving the work.

(1627) Joy asks: 1. How can I make gold paint for gilding china, known as Roman gold, which is of a dark brown color until fired, when it attains a brilliant gold hue? A. It will pay you to buy it. It is finely ground gold leaf mixed with a menstruum such as oil of turpentine, etc. 2. How is candy made, called paste? A. We recommend you to procure some good work on confectionery, such as Complete Practical Confectioner, price $4. 3. Will you also inform me how gelatine plates are made that are used in photography, using, I think, a solution of bichromate of potash. A. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 547. 4. What kind of lenses and how many do I want to make a magic lantern? I have the two object lenses of a pair of opera glasses; would they be of any use? A. For magic lantern, see SCIENTIFIC AMERICAN, vol. 61, No. 58, and others. 5. In making beer, can I use the compressed yeast used in making bread, and how much should I want to use in making a gallon of beer? A. Yes; ascertain quantity by experiment.

(1628) T. B. asks for a good formula for ladies' shoe dressing. A. Pour 1 quart of alcohol of 95 per cent over ½ pound of ruby shellac, close the flask hermetically, let it stand in a warm place for 2 or 3 days, shaking it every day, until the shellac is dissolved. Then dissolve one ounce of dry Castile soap in ½ pint of warm alcohol of 95 per cent, add to it 1½ ounces of glycerine, shake thoroughly, and then add this mixture to the solution of shellac. To give the black color, dissolve 1¼ drachms of aniline black (soluble) in 1 gill of alcohol, add this to the other mixture, close the flask hermetically, shake thoroughly, and let the mixture stand in a warm place for 14 days before using it. To cheapen it you may substitute solution of borax for the alcohol, but the product will dry slowly, and be far inferior in every way.

(1629) K. asks: 1. I am making tinctures and using alcohol 95 per cent to extract. I wish to reduce to proof spirit strength. What amount of water must I add per gallon? A. Proof spirit is made by mixing 5 pints rectified alcohol with 3 pints of water. 2. I wish to reduce proof spirits to 25° below proof. A. To reduce proof spirits to 25° below proof, add 17·65 volumes of water to 100 of the spirit. 3. What rule must I adopt? A. For rule let a=degrees below proof and x=water to be added, then

$$a(100+x)=\tfrac{5}{3}x$$

4. I wish to get recipe for making a good quality Jamaica ginger. A. For extract of ginger soak 50 ounces avoirdupois finely powdered ginger in alcohol, for 48 days, then percolate until exhausted. Reserve the first 43 fluid ounces of percolate, evaporate rest to dryness, and add to the original 43 ounces of percolate. 5. Are there any works published giving information on alcohol, spirits, extracts, essences, tinctures, etc., and the price? A. We can supply you with Dick's "Encyclopedia of Receipts and Processes," $5; "United States Dispensatory," price $8.

(1630) Chemico asks how to make a battery solution for the supplying of one 16 candle power incandescent light. A. For batteries, see our SUPPLEMENT, Nos. 157, 158, and 159, which we can supply for 30 cents. You will need about 30 cells of Brunsen battery. 2. Please give the formula for making calisaya tonic, such as is sometimes sold at soda fountains. A. For elixir calisaya:

Quinine sulphate	72	grs.
Cinchonine sulphate	24	"
Quinidine sulphate	20	"
Cinchonidine sulphate	12	"
Elixir orange	128	fl. oz.

Caramel sufficient to color. Triturate the mixed sulphates with one pint of the elixir of orange, pour the mixture into a glass flask, and heat on a water bath till solution is effected. When still hot, add remainder of elixir and caramel. Filter when cold. 3. Also please give the formula for making fuses that are used for fireworks. A. Soak paper in a solution of nitrate of potash and dry it. For other fuses we refer you to the "Pyrotechnist's Treasury," which we can supply for $1.50.

(1631) C. E. O. asks: 1. What is used in adulterating linseed oil, and how can the adulterating article be detected and shown? A. Fish oil and resin oil are often used. Their detection should be intrusted to a chemist. 2. What is the way wine color is made, its components and their proportions? A. Aniline red, logwood extract, and burnt sugar or caramel are often used in suitable quantity. 3. Where are barytes and chalk found in this country? A. Barytes is mined in Virginia and Missouri; chalk is practically entirely imported. 4. Barytes being used as an adulterant of white lead, would it not answer for a filler? A. Probably, but no better than substances now used. 5. How is whiting (gilder's bolted) prepared from chalk? A. Chalk is pulverized and elutriated and if necessary may be bolted. 6. How is artificial vermilion made, what are its constituents and proportion? A. In the Dutch method sulphur is melted and finely divided mercury is added. After combination the vermilion is sublimed. In the United States, to effect the combination, sulphur, mercury, and an alkaline sulphide are mixed and agitated together. For book on paints, we recommend "The Painter's Encyclopedia," which we can supply for $2.

(1632) J. A. R. asks (1) for a good receipt for antimony plating. A. Use strong solution of chloride of antimony with three Daniell cells as the battery. A good modification is to add some sal ammoniac to the bath. Or tartar emetic 8 parts may be dissolved in hydrochloric acid 4 parts and water 2 parts, all by weight. 2. The same for nickel plating. A. See answer to following query.

(1633) S. N. L. asks: 1. Which is the best season of the year for deading trees so that they will die quickly? A. Do it in summer, when in fullest leaf. 2. What preparation will take ordinary writing ink out of wall paper without affecting the original color of the paper? A. Probably it is impossible. Try blotting paper soaked in tartaric and oxalic acid solution, or "salts of lemon." 3. How to do nickel plating without a battery. A. A battery is needed for most cases. The following solution may be used:

Sulphate of nickel	1,000	parts.
Tartrate of ammonium	725	"
Tannic acid	2	"
Water	20,000	"

All by weight. Before adding it to the solution the tannic acid is dissolved in a little ether. Sometimes instead of a battery it is enough to put some scrap zinc into the solution, taking care that it is in contact with object. But the best method is to use a battery.

(1634) E. E. M. asks (1) how he can remove green fine moss that has taken possession of his stoop. The stoop is brownstone, and all the stoops in the street are the same, and all are coated with this growth, which gives the house a deserted appearance. A. Scrub it off with sand and water. Then when stoop is absolutely dry, an application of paraffin wax melted in would tend to prevent its recurrence. 2. Can you give me the formula of a nickel solution that I can use to plate articles of brass, etc., by hand application. I have a silver solution that I have used for years with fair success. (Nitrate of silver, cyanide potass. in solution, neutralized by ammonia.) A. Nickel will not plate many metals without a battery, as will silver and gold solutions. See answer to preceding query for a nickel plating solution.

(1635) J. B. M. writes: 1. Is it necessary to send billiard balls to the factory to be recolored? Please give the process. A. Aniline colors can be used to color them. Long soaking in water colored thereby will do it. Boiling is often adopted, but is apt to crack the balls and roughen the surface. It is undoubtedly best to send them to the factory. 2. What is used in the desks to finish pigeon holes? A. Flock, a species of fine woolen lint, applied to the surface after sizing or varnishing. 3. A good, cheap size for gilding or bronzing wood and iron? A. There are many kinds. Some are made of best drying oils ground with a little Venetian red, some are made from scraps of parchment and solutions of glue. Copal varnish is excellent for applying bronze powder.

(1636) E. W. R. says: The posts and floors of our warehouse, made of oak, are being destroyed by worms, and we would like to know of some means for destroying them. How would a strong solution of alum in whitewash do for the posts, and for the floor lime water? The first indications of their presence are little piles of dust thrown out of tiny holes, but upon breaking the outside of the wood we find it completely honeycombed, filled with this same fine dust.

A. Professor C. V. Riley of the department of agriculture, division of entomology, says the trouble is due to the work of one or perhaps both of two wood-boring beetles known as *Lyctus striatus* and *Trogoxylon parallelopipedum*. The alum solution in whitewash would probably answer the purpose in a degree, but if the floors and posts could be first oiled, it would make the remedy perfect.

(1637) A. M. A., Cuba, asks: 1. How is corn treated that it may not be attacked by its destroying enemies when gathered and shelled? A. Ventilation and dryness are the means used. In a damp climate kiln drying is imperative. No preparation has been to any extent adopted here. The sense of sanitarians is against all such treatment of food products. 2. What is the solubility of quicklime in distilled water at different temperatures, and where can I find any data as to mode of determining amount of quicklime in solution per cubic centimeter distilled water? A. One wine pint of water at 212° F. dissolves 5.6 grains; at 60° F., 9.7 grains; at 32° F., 11.0 grains. You can determine caustic lime by titration with standard acids. Or you can pass excess of carbonic acid through it and boil, when most of the lime will be precipitated as carbonate, and can be filtered out and weighed. Or still better, add oxalate of ammonia in solution, filter, ignite the precipitate at a very high heat to constant weight, and weigh.

(1638) R. P. asks: 1. Does it require an expert electrician to operate successfully a small incandescent electric light plant—say one of the Edison system of 500 16 candle power lamps? A. No; but the operator should have a good knowledge of the Edison system. 2. If so, can the requisite knowledge be obtained from books, and what books ought one to familiarize himself with to acquire this knowledge? A. Your best plan is to spend some time with the Edison Company and in the study of books.

(1639) J. C. D. asks what will take grease out of white marble. A. Apply a little pile of whiting or fuller's earth saturated with benzine, and allow it to stand some time. Or apply a mixture of 2 parts washing soda, 1 part ground pumice stone, and 1 part chalk, all first finely powdered and made into a paste with water; rub well over the marble, and finally wash off with soap and water.

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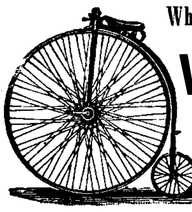

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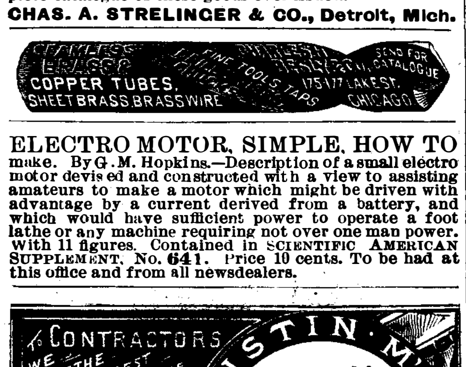

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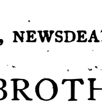

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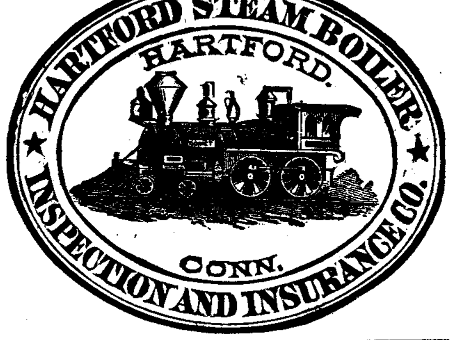

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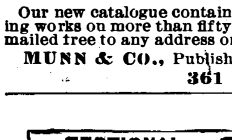

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